THE REGIONAL
MUNICIPALITY OF PEEL

PHYSICAL SURVEY

TOWARDS A REGIONAL OFFICIAL PLAN

POLICY DIVISION
PLANNING DEPARTMENT

MAY 1975

359548

FOREWARD

The Region of Peel is experiencing a rapid rate of urbanization, and each year more land in rural Peel is developed for urban uses. Unfortunately, very little analysis has been made of the overall effects of this urbanization. More specifically, no assessment has been made on a regional scale of the physical, social, economic and environmental impacts of urban growth in Peel.

In presenting this Report, however, the Regional Municipality of Peel is laying the groundwork for just such an assessment. The Physical Survey of the Region of Peel is the first step, both in measuring the environmental impact of urbanization, and in determining the priorities for the use of Peel's natural resources.

ACKNOWLEDGEMENTS

Although this Report was prepared by the Planning Policy Division of the Peel Regional Planning Department, other agencies were of considerable assistance in providing information and advice. Special mention should be made in this regard to the Ontario Ministry of Natural Resources and the Ministry of the Environment. A note of appreciation is also extended to the consulting firm of Gartner Lee Associates Limited for providing the Planning Department with geological, geomorphological and drainage information.

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CHAPTER I

INTRODUCTION

The Regional Municipality of Peel, including the three Area Municipalities of Caledon, Brampton and Mississauga, came into being on January 1, 1974. According to the Provincial legislation which established Regional Government (The Regional Municipality of Peel Act, 1973), Peel Regional Council has the statutory responsibility to prepare and adopt an Official Plan for the Peel Planning Area, and to submit it to the Minister of Housing by December 31, 1976.

As defined in The Planning Act, the term "official plan" means a "program and policy, or any part thereof, covering a planning area or any part thereof, designed to secure the health, safety, convenience or welfare of the inhabitants of the area, and consisting of the texts and maps, describing such program and policy."

The purpose of the official plan is to provide a formally adopted set of public policies, and standards as guidelines for the future development of the Region of Peel.

When the Peel Regional Official Plan is approved by the Minister:

1) every official plan and restricted area (zoning) by-law in Caledon, Brampton and Mississauga must be amended to conform with the Regional Official Plan;

2) no official plan or restricted area (zoning) by-law in Caledon, Brampton and Mississauga can be passed unless it conforms with the Regional Official Plan;

3) no public work may be carried out by the Region, the Area Municipalities and local Boards and Commissions unless it conforms with the Regional Official Plan;

4) plans of subdivision will not be approved unless they are in conformity with the Regional Official Plan; and

5) the Regional Land Division Committee must have regard to the provisions of the Regional Official Plan when deciding whether or not to grant a consent to the conveyance of land under Section 29 of The Planning Act.

As part of its planning duties under The Regional Municipality of Peel Act, 1973, Regional Council is obliged to investigate and survey the physical, social and economic conditions in relation to the development of the Peel Planning Area. In particular, Council is required to:

"1) prepare maps, drawings, texts, statistical information and all other material necessary for the study, explanation and solution of problems or matters affecting the development of the Peel Planning Area;

2) hold public meetings and publish information and all other material necessary for the study, explanation and solution of problems or matters affecting the development of the Peel Planning Area; and

3) consult with any local board having jurisdiction within the Peel Planning Area."

The following Report, entitled Physical Survey, is the outcome of efforts relating to 1) above. The Report was prepared by the Planning Policy Division of the Peel Planning Department. It has been compiled: 1) to bring together a wide variety of physical information on Peel under one cover; 2) to record as much of this information as possible on a series of identical base maps; and 3) to provide a convenient and readily accessible collection of background material for the preparation of the Regional Official Plan. In general, it is hoped that this Report will assist all concerned to gain a better understanding of the physical characteristics of the Region of Peel. It is also hoped that this assembly of information on the physical features of the Region will be of direct assistance to the Area Municipalities in providing a Regional context for their Official Plan Reviews.

There are eighteen Chapters and twenty-seven Maps in the Report. Chapters I and II are introductory in nature. Chapter III provides general information on local climate. Chapters IV and V focus respectively on bedrock geology and surficial geology. Chapter VI deals with the physiography and topography of Peel. Sand and gravel and other mineral resources are the subjects of Chapter VII, while surface drainage, wetlands and groundwater are dealt with in Chapters VIII and IX.

Soil types and agriculture are described briefly in Chapters X and XI. Forestry is discussed in Chapter XII, recreation in Chapter XIII; and fish and wildlife in Chapter XIV. Chapter XV is devoted to Environmental Protection Areas, as defined and mapped by the Ontario Ministry of Natural Resources. Major existing land uses, transportation facilities and utilities are identified in Chapter XVI, and jurisdictional areas are delineated in Chapter XVII. The Report concludes in Chapter XVIII with a discussion of the relevance of the physical survey to regional planning in Peel.

CHAPTER II

AREA AND LOCATION

As indicated on Map 1, The Regional Municipality of Peel (Region of Peel) is located in South Central Ontario and bounded on the west by the County of Wellington and the Region of Halton; on the east by the Region of York and Metropolitan Toronto; on the north by the Counties of Dufferin and Simcoe; and on the south by Lake Ontario.

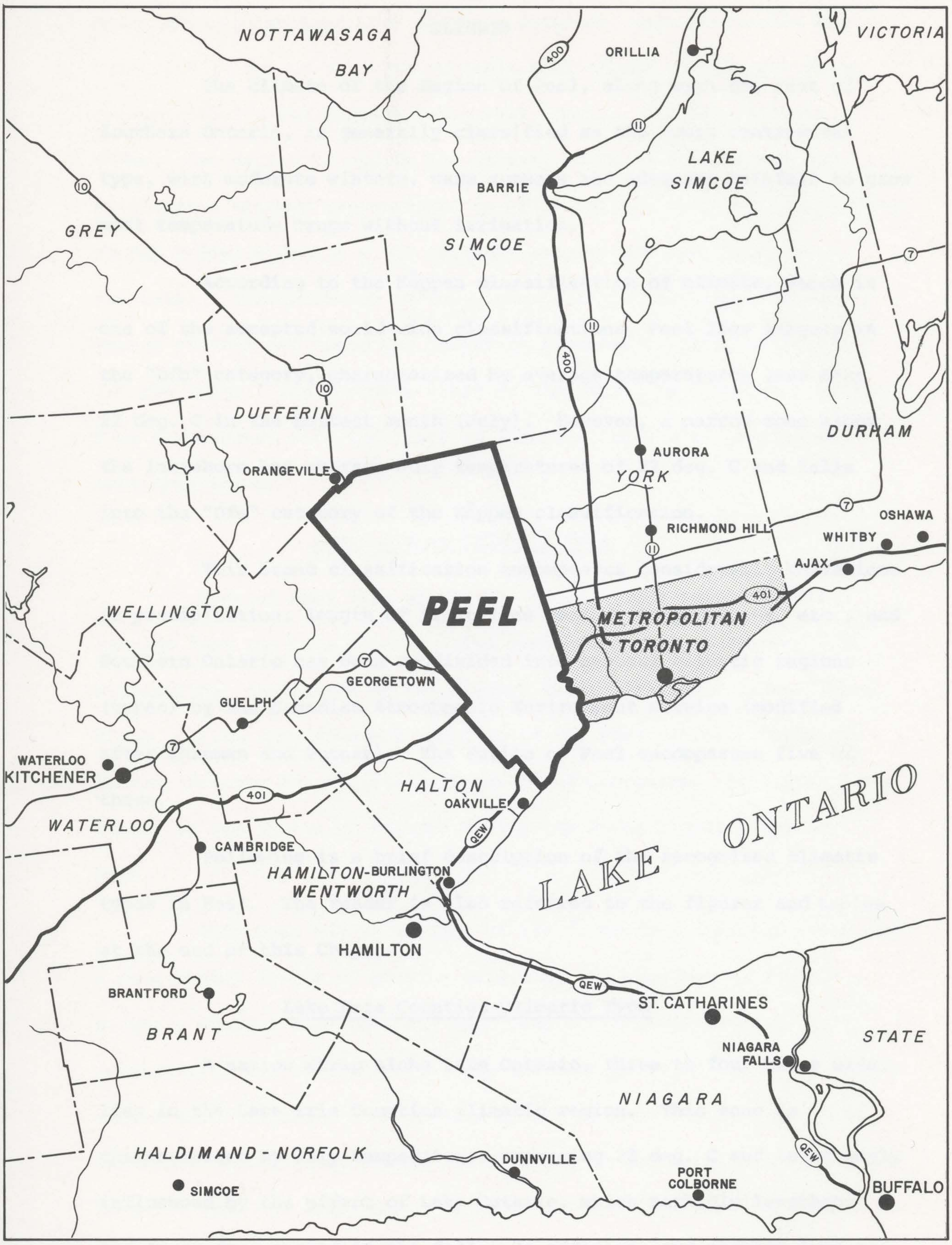
The Regional Municipality of Peel consists of three Area Municipalities; namely, the Town of Caledon and the Cities of Brampton and Mississauga. The areas and 1974 populations of the Regional Municipality of Peel and the three Area Municipalities are as follows:

MUNICIPALITY	AREA SQUARE MILES	AREA ACRES	% OF TOTAL AREA OF PEEL	POPULATION (OCTOBER, 1974*)	% OF TOTAL POPULATION OF PEEL
Town of Caledon	270.4	173,043	55.5	19,375	5.9
City of Brampton	104.0	66,566	21.3	88,820	26.8
City of Mississauga	113.3	72,519	23.2	222,437	67.3
Regional Municipality of Peel	487.7	312,128	100	330,632	100.0

* Assessed Population (October 8, 1974), Ontario Ministry of Revenue, Assessment Region No. 15.

The Region of Peel forms a part of both the Toronto-Centred Region, as delineated by the Province's 1970 Toronto-Centred Region Plan, and the Provincially defined Central Ontario Lakeshore Urban Complex (C.O.L.U.C., 1974).

LOCATION MAP



REGIONAL MUNICIPALITY OF PEEL

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Scale 1" = 14 miles

MAP 1

REGION OF PEEL PLANNING DEPARTMENT MJB 3/75 DWG NO P-A2

CHAPTER III

CLIMATE

The climate of the Region of Peel, along with the rest of Southern Ontario, is generally classified as the humid continental type, with moderate winters, warm summers and adequate rainfall to grow most temperature crops without irrigation.

According to the Köppen classification of climate, which is one of the accepted world-wide classifications, Peel lies largely in the "Dfb" category, characterized by average temperatures less than 22 deg. C in the hottest month (July). However, a narrow zone along the lakeshore has average July temperatures of 22 deg. C and falls into the "Dfa" category of the Köppen classification.

This broad classification encompasses considerable variations in precipitation, length of frost-free period, temperatures, etc., and Southern Ontario has been subdivided into several climatic regions (types) by the Canadian Atmospheric Environment Service (modified after Chapman and Putnam). The Region of Peel encompasses five of these.

Following is a brief description of the recognized climatic types in Peel. The reader is also referred to the figures and tables at the end of this Chapter.

Lake Erie Counties Climatic Type

A narrow strip along Lake Ontario, three to four miles wide, lies in the Lake Erie Counties climatic region. This zone is characterized by July temperatures averaging 22 deg. C and is strongly influenced by the effect of Lake Ontario, which markedly lengthens the frost-free period in the fall. In addition, and perhaps just as importantly, it reduces early high daytime temperatures in the spring, thereby lessening the chance of fruit tree blossoms opening prematuraly with the risk of later damage by frost. This feature of the climate is similar to that experienced in the Niagara Fruit Belt (although perhaps less strongly defined), with the result that this area is one of the most suitable in Southern Ontario for fruit growing outside the Niagara Fruit Belt itself. The Lake Ontario effect also serves to modify the diurnal range of temperature and ameliorates minimum temperatures in winter (it is rare for temperatures to dip below-29 deg. C - the critical temperature for peach tree survival). Precipitation (notably snowfall) is the lowest in the Region of Peel and among the lowest in Southern Ontario, averaging 28" per annum. The northern limit of the Lake Erie Counties Climatic Type corresponds with the limit of Köppen's "Dfa" classification mentioned above.

South Slopes Climatic Type

Most of Peel lies within the South Slopes region. This extends from the Lake Erie Counties region (roughly at Highway 5 in Mississauga) northwards to the Niagara Escarpment and Caledon-Albion Hills (i.e., approximately the area of the Peel plain). Brampton, Malton (Toronto International Airport) and Georgetown (just over the border in the Region of Halton) typify the South Slopes Climatic Type.

This area has an average of 145 frost-free days per annum and a mean annual length of growing season of 205 days per annum; i.e., slightly shorter than the Lake Erie Counties region. Average July temperatures are 19-20 deg. C. The southern parts of the South Slopes region are influenced to a certain extent by Lake Ontario, but this influence decreases away from the lake and is insignificant beyond 20 miles from the lakeshore. Perhaps the most important influence of Lake Ontario felt in the south of the Peel plain is a lengthening of the frost-free period, notably in the fall.

The Niagara Escarpment and Upland areas to the north and northwest exert a slight influence on the local area of the Peel plain, producing a slight rain (and snow) shadow effect. Total precipitation on the Peel plain averages about 30" with about 24-25" rain and 53" snow per annum. Of particular interest is the fact that the area around Brampton is the sunniest in Southern Ontario, and one of the sunniest in Canada. This results from its location slightly away from Lake Ontario and in the lee of the Niagara Escarpment. Brampton has almost a hundred hours more sunshine per annum than does Toronto.

Northern Peel

Northern Peel; i.e., the Uplands area north of the Niagara Escarpment and including the Caledon-Albion Hills area, falls into three climatic subdivisions whose boundaries converge in this area. Since boundaries are gradational, there is not a great difference between these climatic types.

The more important differences are seen between the Northern Peel Uplands (collectively) and the South Slopes Region. The climatic subdivisions of Northern Peel are the Huron Slopes Climatic Type, the Simcoe Climatic Type and the Dundalk Uplands Climatic Type.

Huron Slopes Climatic Type

The area on top of the Escarpment above Terra Cotta and Inglewood, and including the Belfountain area, lies in the extreme eastern part of the Huron Slopes Region. Largely because of its elevation, this area receives somewhat lower temperatures, more snow, and has a shorter growing season than the South Slopes (Peel plain). The climate, however, is less severe than in the Dundalk Uplands Type.

Simcoe Climatic Type

Most of Northern Peel lies within the Simcoe Climatic Type. The former Village of Caledon and Mono Mills, Albion and Palgrave are in this zone. Generally, annual and seasonal temperatures are similar to those of the Huron Slopes. Precipitation may be marginally less than in both the Huron Slopes and Dundalk Uplands because of the slight rain shadow effect created by the higher elevation of the Dundalk Uplands, but it is slightly greater than in the South Slopes area - notably snowfall in winter. Owing to the diverse topography of this area, local climatic variations (microclimates) may be apparent, although they are not evident from the rather sparse statistics available for the area.

Dundalk Uplands Climatic Type

Only the extreme northwest corner of Peel is classified within the Dundalk Uplands Climatic Type (the boundary is drawn roughly through Orangeville to just south of Alton). Since this corner of Peel is in the extreme southeastern part of the Dundalk Uplands area, the climate is less severe than in the Dundalk Uplands proper. However, the elevation here (up to 1600 feet) and the more northerly location away from Lake Ontario, result in the most severe climate found in the Region of Peel. The frost-free period and growing seasons are the shortest; precipitation (notably snowfall) is heaviest and temperatures at all seasons the lowest (especially in winter). The Dundalk Uplands have the most severe climate in southwestern Ontario, comparable to areas further north and northeast in the Province. Nevertheless, the climate is still "moderate" by overall Canadian standards.

Climatic Factors of Importance to Agriculture

Frost-free Period

The average length of the frost-free period is the average period (in days) between the last occurrence of 0 deg. C air temperature in spring and the first occurrence in the fall. Figure 2 shows the frost-free isopleths for Peel. Actual dates of the first and last frosts may vary considerably from year to year. (Most apple orchards are found in areas having over 140 frost-free days on the average.) The frost-free interval is particularly useful in determining when it is safe to grow tender crops such as beans, corn, tomatoes, cucumbers, etc., and when it is safe for blossoms and fruit. Temperatures below 0 deg. C will damage such crops. A temperature of -4 deg. C is taken as the one at which even the most hardy crops will be damaged severely. A temperature of -4 deg. C will occur approximately 29 days before the last occurrence of 0 deg. C in the spring, and 29 days after the first frost in the fall.

Growing Season

The perennial crop growing season is that period in an average year during which the mean daily temperature is +5.5 deg. C or higher. (+5.5 deg. C is generally accepted as the useful temperature at which most temperate plants begin active growth, but individual species vary considerably, and growth is dependent on other climatic factors too.) "Growing degree days" is another useful index for plant growth and maturity (different crops require different minimum growing degree days to reach maturity). It is the number of degrees of mean daily temperature above +5.5 deg. C throughout the growing season. Figure 2 shows the growing degree days for Peel. This Figure illustrates the markedly more favourable climate for agriculture of the lakeshore (3800 growing degree days) as compared with the extreme northwest of the Region (2900 growing degree days).

Heat Units for Corn

Corn is an important crop in Southern Ontario for both silage and grain. It uses the full frost-free period to complete its life cycle. "Corn Heat Units" (C.H.U.) are values deduced by formula from the maximum and minimum temperatures. The mean annual heat units for Corn (Figure 3) are the sum of daily values over the growing season, assuming that planting in spring starts when the mean daily temperature reaches +13 deg. C. This measure is considered useful in determining efficient use of climate for planning growing of corn. Most shelled corn is grown in areas having 2900 or more C.H.U., but it may be grown in areas having as low as 2500 C.H.U. As can be seen from Figure 3, the 2900 C.H.U. isotherm runs through Mississauga, and the 2700 C.H.U. isotherm traverses the Peel plain through Brampton. Thus, areas north of Brampton may be considered less favourable for grain corn.

Precipitation

Average annual precipitation in the Region of Peel ranges from 28 inches in the extreme south to about 32 inches in the extreme northwest. Although there is little overall variation in total precipitation, there is a marked variation in snowfall from about 48 inches average in the extreme southwest to roughly 72 inches average in the northwest of the Region (within the Dundalk Uplands Climatic Type). Additionally, snow cover is more continuous in winter in the Northern Peel Uplands (less subject to frequent total thawing during winter). This is of importance for winter recreational activities. Winter snowfall can be very variable from one year to the next; for example, since 1938, snowfall at Malton has been as low as 21" and as high as 81". The annual precipitation is quite uniformly distributed throughout the year, each month receiving 2" to 3" (the driest at Toronto International Airport is February with 1.95", and the wettest is July with 2.95"). This is assumed to be the order of magnitude for the whole Region. Extremes of total annual precipitation have ranged from 20" to 38" at Malton (1938-1974).

Rainfall in summer tends to be of shorter duration, but more intense than at other times of the year, sometimes occurring from thunderstorms. Annual precipitation over the entire Region is adequate for agriculture. Extended dry periods (droughts) of a month or more are quite rare, but short dry spells of seven days or more are quite common in any month of the growing season. There is roughly a 50% chance of a dry spell of 7 days or more in any month, but a chance of only 10-15% of 14 or more dry days per month.

Wet periods, with measurable precipitation on 5 or more consecutive days, are rare in summer, but there is approximately a 15-20% chance of such wet periods from November to March and in May. Prolonged heavy rainstorms (and snowstorms) are fairly rare, occurring about once every six years on the average, with their consequent effects of flooding, erosion and property damage (e.g., Hurricane Hazel in October 1954, which centred on Brampton, and dumped 8" of rain with 7.02" of this falling in 24 hours). Ice storms (freezing rain) severe enough to cause damage to telephone lines, power lines, and trees occur about once in three years on the average.

Temperature

Average temperatures have been alluded to earlier in this Chapter and may be deduced from Table 2 at the end of the Chapter. The annual and diurnal temperature ranges are greatest in the Northern Peel Uplands and least along the lakeshore. The mean daily range in Northern Peel is about 8 deg. C in January and 12-14 deg. C in July (location with respect to topography is important here). At the lakeshore, the diurnal range is about 7 deg. C in January and 10 deg. C in July. Extremes of temperature of +38.3 deg. C in July, and -31 deg. C in December and February, have been recorded at Toronto International Airport (since 1938). (It is probable that considerably lower minimum temperatures have occurred in Northern Peel.)

Critical temperatures relating to agriculture are as follows:

Daily Maximum Temperature	≤ 0 deg. C	No growth
	≤ +10 deg. C	Corn growth only
	= +30 deg. C	Optimum corn growth
	> +30 deg. C	Growth decreases for many plants; a pleasant summer day for recreation activities
Daily Minimum Temperature	= 0 deg. C	Tender plants freeze
	= -2 to -4 deg. C	Frost damage to potatoes, sugar beets, celery, onions, etc.
	≤ -4 deg. C	Severe damage even to hardy crops such as cabbage and turnips

Daily Minimum Temperature	= -24 deg. C	Lower limit for peach bud survival
	≤ -29 deg. C	Peach tree survival unlikely (very rare in Southern Peel)

Wind

Wind speed and direction are important for such things as airports, the location of some industries, refuse disposal, agricultural pursuits such as crop spraying, the design of buildings, and to a lesser extent, erosion. The only wind records in Peel relate to the Toronto International Airport, but it is not anticipated that winds vary much from this on average over the Region, with the exception of some local effects of topography in the vicinity of the Niagara Escarpment, the hilly areas of Northern Peel, and the lakeshore, where summer lake/land breezes may modify the general pattern.

At Malton, prevailing winds are from the north, west and southwest. Winds from the southeast and south are the least frequent. Mean annual wind speed is 9.9 m.p.h. at Malton - ranging from 11.8 m.p.h. in January to 8.1 m.p.h. in July and August. The maximum hourly wind speed at Malton was 67 m.p.h. from the west (gusting to 84 m.p.h.). Wind velocities have been slightly lower on the average in recent years. Refer to Figure 7 at the end of this Chapter for wind roses for the Toronto International Airport.

Weather

Southern Ontario (including Peel) lies within the "stormy zone" of the temperate latitudes, between arctic and tropical air masses. Storms formed by the clash of these air masses move along the zone between them generally from the southwest or west, in a northeasterly direction. The frequent succession of depressions and associated frontal systems formed in this zone, and the intervening cells of high pressure originating from the cold or warm air masses to the north and south respectively, bring the familiar variety of weather to Southern Ontario. The frontal zone (or "arctic front") between the tropical and arctic air masses, tends to move north in summer, south in winter. Hence the intervening high pressure cells are more often southern in origin in summer, bringing warm and sometimes humid (gulf) air; and northern or arctic continental in origin in winter, bringing clear, cold, dry air.

Climatic Change

In keeping with world-wide trends in the Northern Hemisphere, changes are evident in average temperatures, precipitation and other weather phenomena over time. For example, at Toronto, this change is evident by a drop in temperature of 1-2 deg. C over the last twenty years. The significance of this is difficult to ascertain at this time. However, a continuation of this trend could make the growing of crops more difficult in parts of the Region by the significant reduction of the average length of the growing season. Certain crops would of course be more sensitive than others (notably corn). Such possible long-term changes should be taken into consideration in the development of long-range planning policies.

CLIMATIC REGIONS

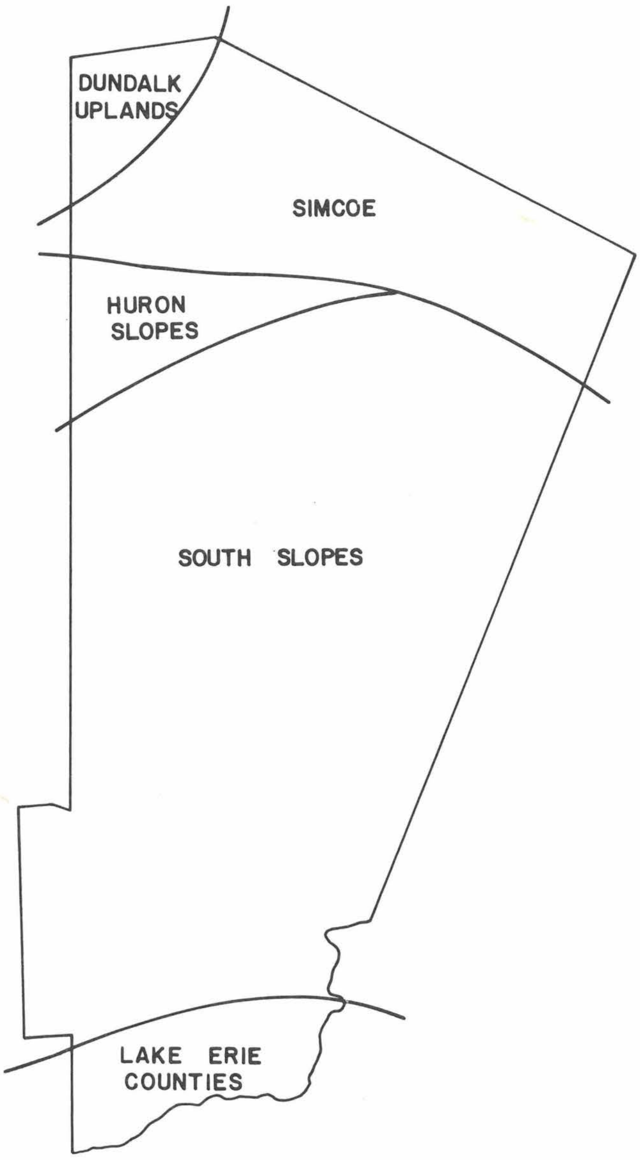


FIGURE 1

Table 2

CLIMATE OF PEEL

Climatic Type	Lake Erie Counties	South Slopes	Huron Slopes	Simcoe	Dundalk Upland
Altitude (feet above sea level)	300	700	1100	1000	1600
Mean Annual Temperature °F/°C	47 / 8	45 / 7	44 /7	43 / 6	42 / 6
Mean Daily Maximum Temperature °F/°C					
- January	31 /-1	28 /-2	27 /-3	27 /-3	25 /-4
- April	51 / 11	53 / 12	51 / 11	51 / 11	49 / 9
- July	81 / 27	81 / 27	79 / 26	79 / 26	77 / 25
- October	60 / 16	59 / 15	58 / 14	58 / 14	56 / 13
Mean Daily Minimum Temperature °F/°C					
- January	18 /-8	14 /-10	14 /-10	11 /-12	11 /-12
- April	36 / 2	33 / 1	32 / 0	31 /-1	30 /-1
- July	60 / 16	58 / 14	56 / 13	57 / 14	54 / 12
- October	42 / 6	39 / 4	38 / 3	39 / 4	36 / 2
Daily Range of Temperature °F/°C					
- January	13 /-11	15 /-9	15 /-9	16 /-9	15 /-9
- July	20 /-7	23 /-5	22 /-6	23 /-5	23 /-5
Extreme Low Temperature °F/°C	-27 /-33	-39 /-39	-43 /-42	-42 /-41	-27*/-33
Extreme High Temperature °F/°C	106 / 41	105 / 41	102 / 39	104 / 40	93*/ 34
Mean Date of Last Frost in Spring	May 7	May 15	May 18	May 18	May 23
Mean Date of First Frost in Fall	Oct. 15	Oct. 5	Sept. 30	Sept. 30	Sept. 25
Mean Annual Frost Free Period (Days)	160	145	135	135	125
Start of Growing Season	April 10	April 13	April 17	April 18	April 20
End of Growing Season	Nov. 8	Nov. 3	Oct. 31	Oct. 31	Oct. 26
Mean Annual Length of Growing Season	210	205	195	195	190
Mean Annual Growing Degree-Days	3800	3500	3200	3200	3000
Mean Annual Precipitation (inches)	28	30	32	31	33
Mean Annual Snowfall (inches)	50	56	72	70	80
Mean Annual Potential Evapotranspiration (inches)	25	24	23	23	22
Mean Annual Actual Evapotranspiration (inches)	21	21	21	22	21
Mean Annual Moisture Deficiency (inches)	4	2	1	1	1
Mean Annual Water Surplus (inches)	11	11	11	11	12

NOTE: Most data in this table are based on 30 to 50 years of record, however those indicated with an * began in 1944.

Adapted from "The Climate of Southern Ontario", Atmospheric Environment, Canada.

Table 3

CLIMATIC STATIONS IN THE REGION OF PEEL (1968)

Place	Data	Period*
Malton (Toronto International Airport)	Full synoptic and hourly data	1937 -
Brampton	t, p, s	1870 - 1888 1948 -
Clarkson	t, p	1949 - 1967
Snelgrove	p	1950 - 1962
Alton	t, p	1887 - 1964
Port Credit	p	1871 - 1892+ 1948 - 1949 1951 - 1961
Streetsville	t, p	1886 - 1888+ 1963 -
Woodbridge (York)	t, p	1948 -
Georgetown (Halton)	t, p	1882 -

t = temperature

p = precipitation

s = sunshine

* stations with long records may have been resited locally

+ discontinuous record

Note: Several other stations have recorded temperature and/or precipitation over limited periods.

MEAN ANNUAL GROWING DEGREE DAYS
LENGTH OF GROWING SEASON
AND FROST-FREE PERIOD

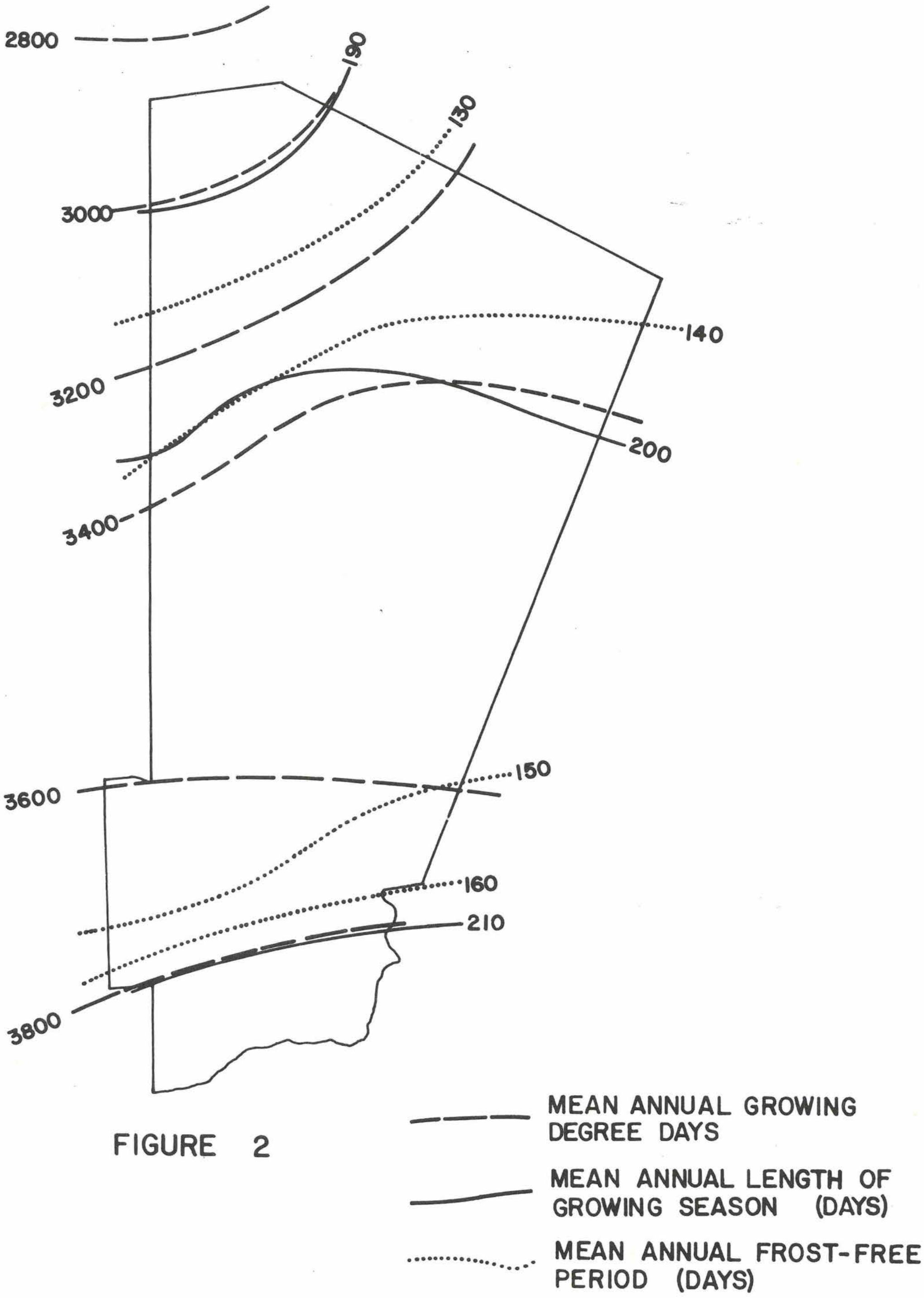

2800
190
130
3000
140
3200
200
3400
3600
150
160
210
3800
MEAN ANNUAL GROWING DEGREE DAYS
MEAN ANNUAL LENGTH OF GROWING SEASON (DAYS)
MEAN ANNUAL FROST-FREE PERIOD (DAYS)

FIGURE 2

MEAN ANNUAL HEAT UNITS FOR CORN

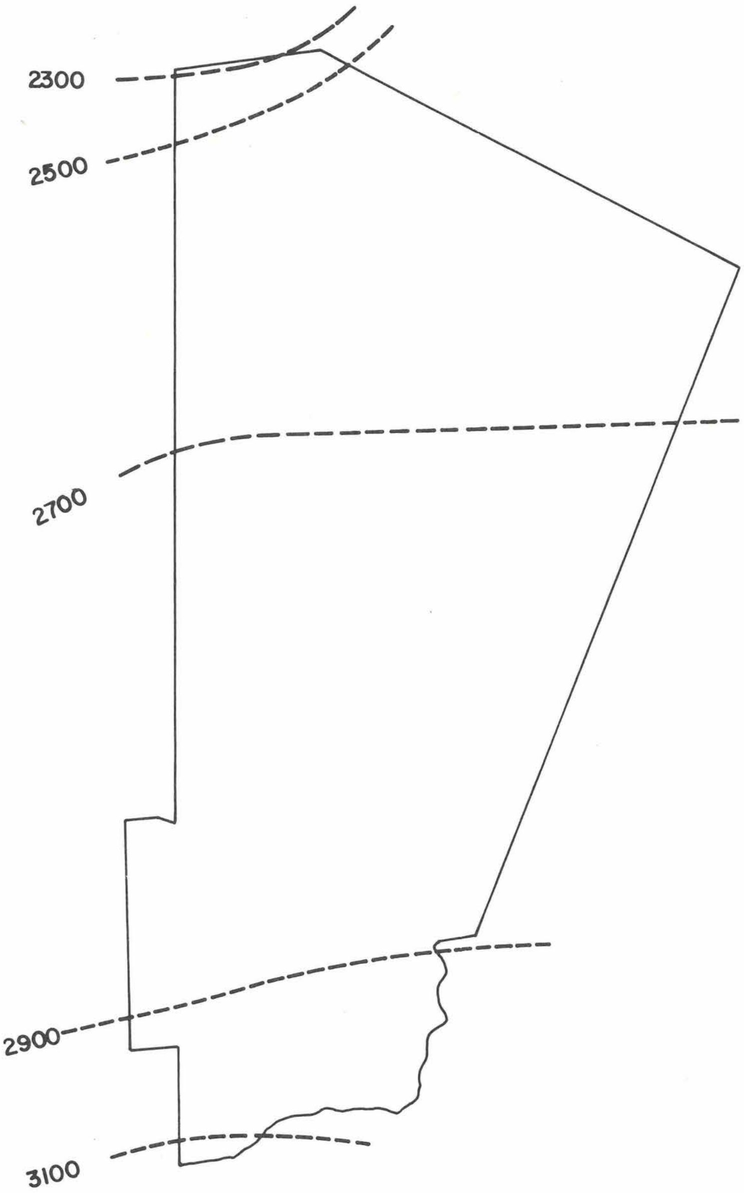


FIGURE 3

PRECIPITATION AND SNOWFALL (in's.)

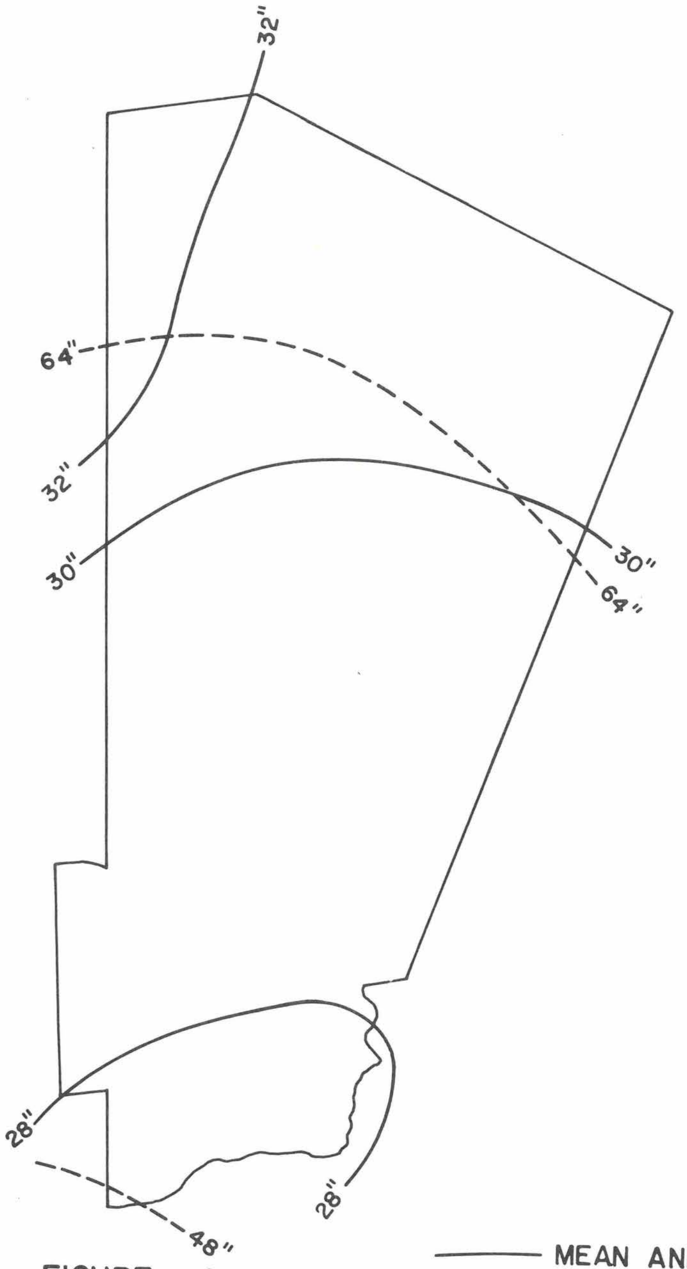


FIGURE 4

MEAN DAILY MAXIMUM AND MINIMUM TEMPERATURES FOR JANUARY (°C)

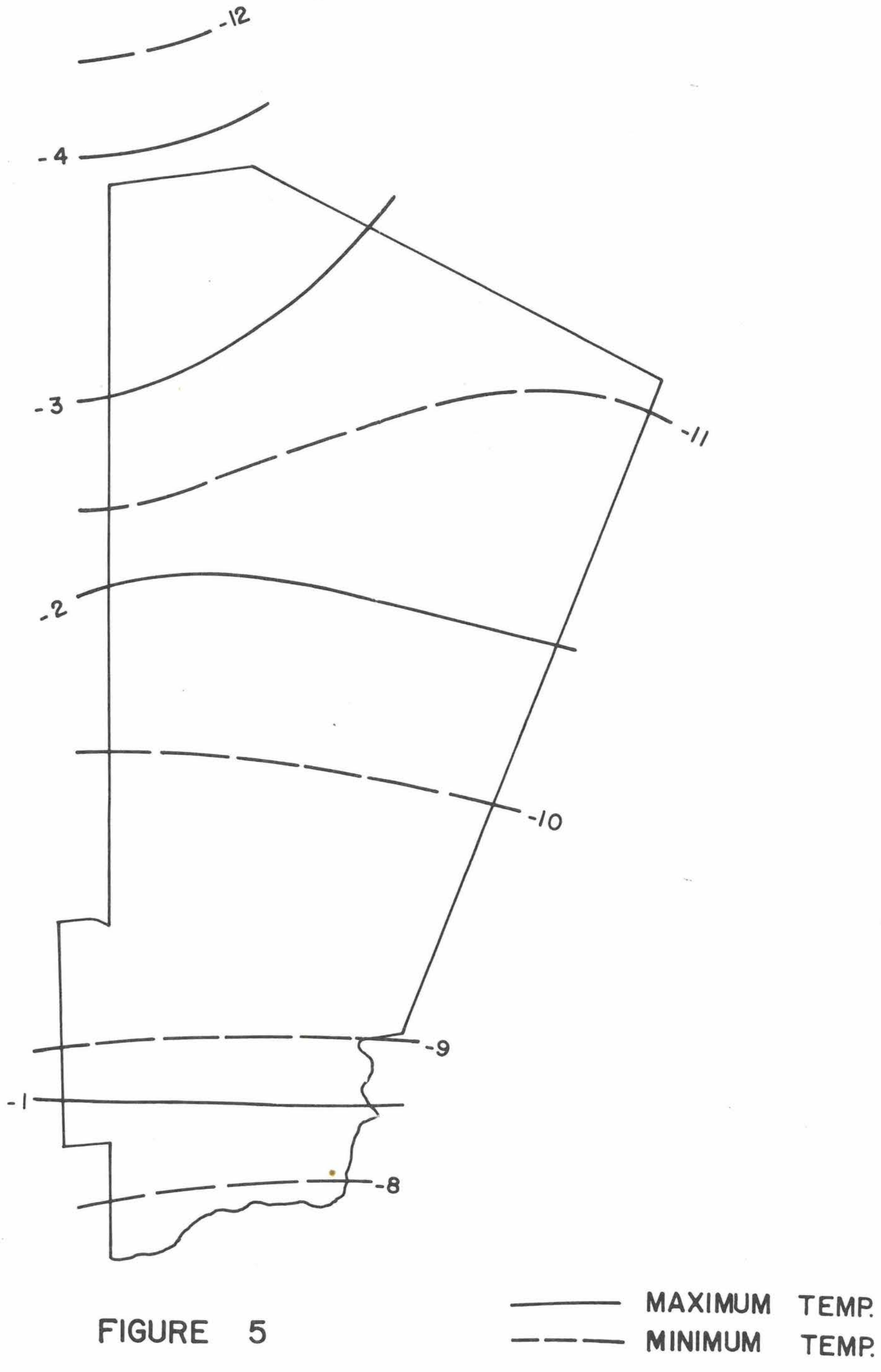


FIGURE 5

MEAN DAILY MAXIMUM AND MINIMUM TEMPERATURES FOR JULY (°C)

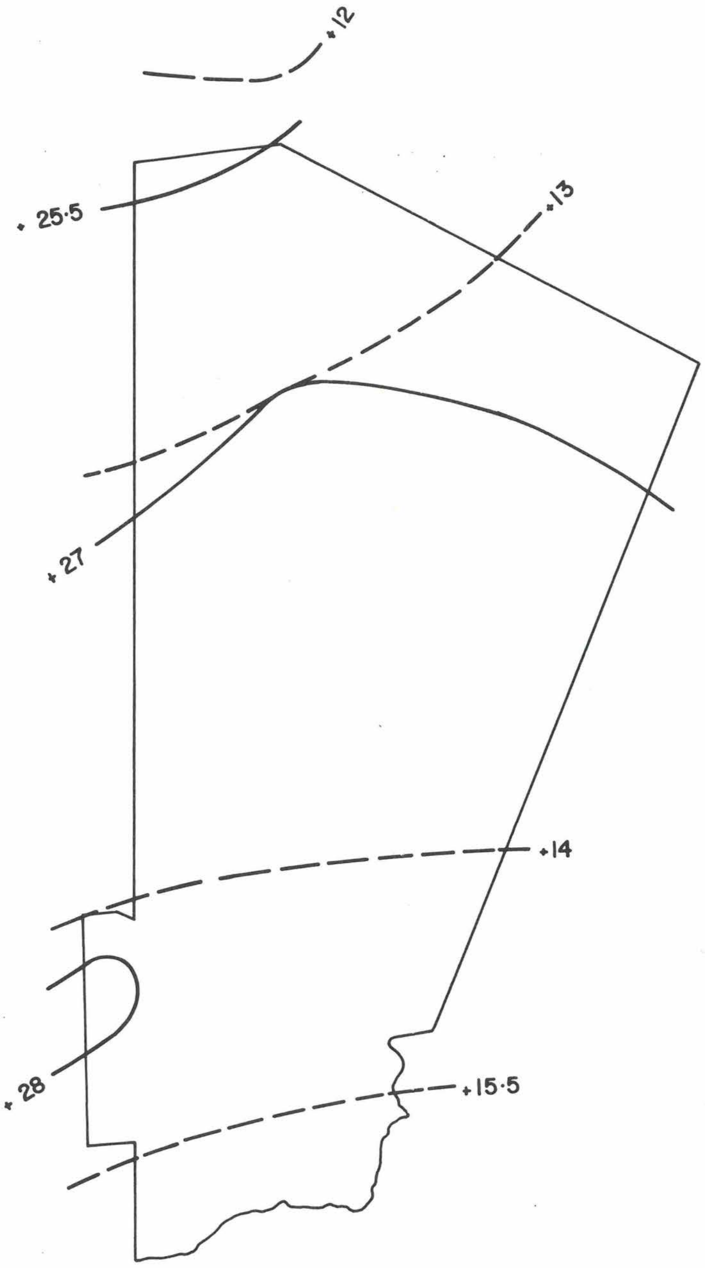
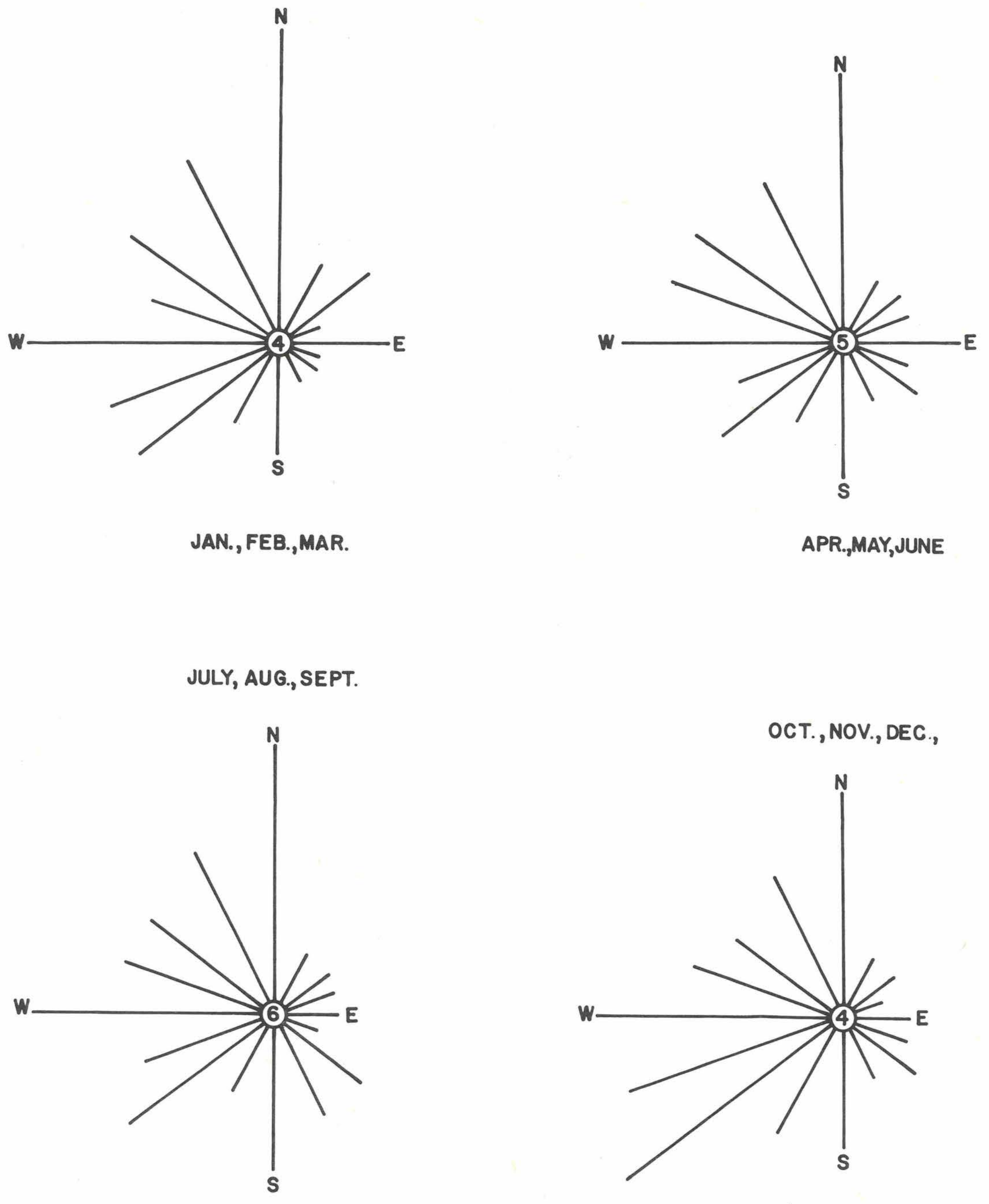


FIGURE 6

——— MAXIMUM TEMP.
- - - - MINIMUM TEMP.



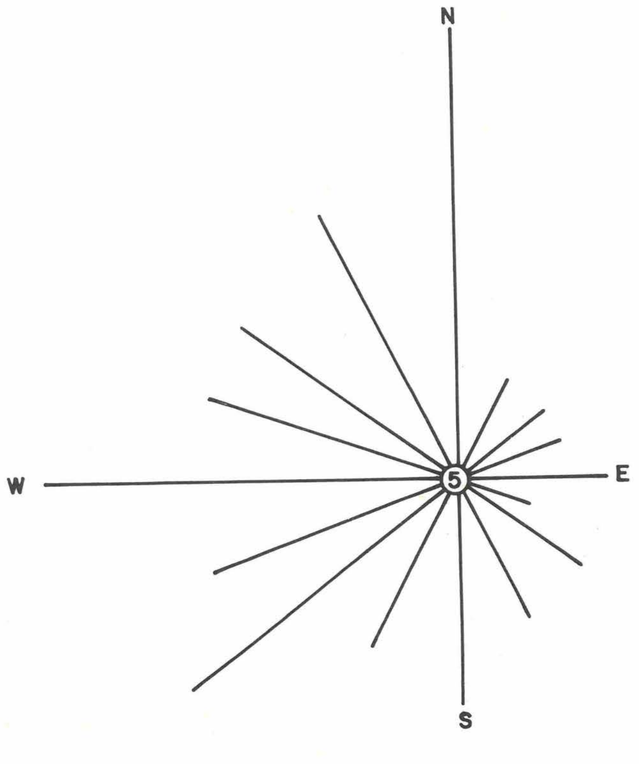
JAN., FEB., MAR.

APR., MAY, JUNE

JULY, AUG., SEPT.

OCT., NOV., DEC.,

WIND ROSE : AVERAGE CONDITIONS BY QUARTER
1955-66 MALTON AIRPORT



WIND ROSE : AVERAGE ANNUAL CONDITIONS
1955-66 MALTON AIRPORT

—— = 1% OF TOTAL WIND
⑤ = PERCENTAGE CALM

FIGURE 7

SOURCE : PROCTOR AND REDFERN LTD., 1974

CHAPTER IV

BEDROCK GEOLOGY

The bedrock in the Region of Peel consists of shales and dolomites ("dolostones") of Ordovician to Middle Silurian age (Palaeozoic era), dating from approximately 450 to 415 million years ago. The bedrock dips southwest at roughly 20 feet per mile (3 to 4 degrees). The shale and dolomite formations found in Peel lie in the eastern part of the Michigan Basin, a giant shallow synclinal structure or basin whose formations extend from east central New York State to Michigan, Wisconsin and Illinois.

In Peel, as in much of Southern Ontario, glacial overburden dating from the last (Wisconsinan) glaciation obscures much of the Palaeozoic bedrock. In many places, the bedrock is moderately to deeply buried beneath the glacial drift, but there are areas where the overburden is thin (refer to Map 2), and in several places, the bedrock is exposed (notably along the Niagara Escarpment and in parts of the southwest, east and southeast sections of the Region).

Palaeozoic rocks are divided into several units or formations as shown in Table 4.

The Precambrian basement complex of igneous and metamorphic rocks (Canadian Shield) lies about 1,100 feet below the surface in eastern Peel, and at a depth of 2,200 feet in the northwest above the Niagara Escarpment.

Georgian Bay Formation

This is the lowermost and oldest formation outcropping in the Region of Peel. It is the lithostratigraphic equivalent of the biostratigraphic Meaford-Dundas Shale. The Georgian Bay Formation consists of blue-grey shale with some limestone/dolomite

TABLE 4

CLASSIFICATION OF BEDROCK FORMATIONS IN PEEL

ERA	AGE (MILLION YEARS)	SUB-SYSTEM	GROUP	FORMATION	THICKNESS (FT.)	LITHOLOGY
PALAEOZOIC	415	MIDDLE SILURIAN (NIAGARAN SERIES)	ALBEMARLE	GUELPH*		Cream to brown, fine to med. crystalline dolomite containing numerous bioherm reefs
				AMABEL	to 130	Light buff to grey, med. crystalline dolomite containing bioherm reefs. Highly fossiliferous.
			CLINTON	FOSSIL HILL-REYNALES	7 - 8	Grey to brown, fine to med. crystalline dolomite. Fossilferous. Fossil Hill Fm. north of Caledon, transitional facies south of Caledon
		UPPER SILURIAN (ALEXANDRIAN SERIES)	CATARACT	CABOT HEAD	48	Thin bedded, fissile, grey shale with thin interbeds of grey to rust weathering calcareous sandstone and dolomitic limestone.
				MANITOULIN	11 - 15	Brown and grey, aphanitic to fine crystalline, argillaceous dolomitic limestone with grey shale partings and occassional white chert.
				WHIRLPOOL	10 - 15	Medium to fine, grey to red or mottled, thin to massive bedded orthoquartzitic sandstone
	425	XXXXXXXXXXXXXXXXXXXXXXXXX UNCONFORMITY OR DISCONFORMITY XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX				
		UPPER ORDOVICIAN		QUEENSTON	450	Red shale and mudstone with minor interbeds of sandy and silty limestone and dolomite. Non-fossiliferous.
				GEORGIAN BAY (MEAFORD-DUNDAS)	515 - 580	Grey and greenish - grey shale with interbeds of siltstone, sandstone, limestone and dolomite. Fossiliferous.
				+WHITBY	290	Blue Mountain Shale - alternating dark grey and dark brown bituminous shale. Collingwood Shale - black bituminous shale.
		MIDDLE ORDOVICIAN	+ SIMCOE	+BLACK RIVER +TRENTON	500 - 600	Limestones with interbeds of shale.
				+SHADOW LAKE	0 - 40	Arkose and red and green shale
	500	XXXXXXXXXXXXXXXXXXXXXXXXX UNCONFORMITY XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX				
PRECAMBRIAN				+ BASEMENT COMPLEX (CANADIAN SHIELD)		Igneous and metamorphic rocks: red granite gneiss, minor meta-limestone etc.

+ Not exposed in Peel, but present at depth

* Not present in Peel - occurs about 1/2 mile NW of extreme NW corner of the Region.

and calcareous sandstone interbeds and lenses. It underlies the eastern half of Peel as well as all of the City of Toronto, and extends into York Region beneath a deep mantle of glacial drift. The total thickness of the Georgian Bay Formation is about 515 feet in the southeastern part of Peel, but there is some evidence that it thins slightly to the north. (The Georgian Bay Formation conformably overlies the Blue Mountain Shale and the contact is often difficult to distinguish.)

The Georgian Bay Formation is quarried for shale to manufacture brick, tile and sintered aggregate. It is subdivided into several members as indicated in the accompanying Table.

The uppermost Meaford shale is about 115 feet thick and has more hard limy and sandy layers. The Humber member of the Dundas shale is the principal unit of the Georgian Bay Formation in Peel. It contains some 10 to 20% of hard limy and more sandy layers.

The Georgian Bay Formation was laid down in an ancient sea, and is fossiliferous in places. There are well-preserved trilobites associated with the hard calcareous and sandy layers, especially in the lower part of the Meaford shale unit.

Queenston Formation

Conformably overlying the Georgian Bay Formation is the Queenston Formation. It underlies a large area of central Peel, from the base of the Niagara Escarpment eastwards to near Streetsville, Bramalea and the former Township of Albion. The Formation is Upper Ordovician in age and consists of brickred, thinly bedded, fissile shale with interbeds and lenses of greenish-grey sand and/or limy layers. There are also some seams and bands of greenish shale following bedding planes and fractures within the red shale sequence; and some patches and geodes with calcite and some gypsum nodules. The Queenston Shale Formation is unfossiliferous. The contact with the underlying Meaford Shale of the Georgian Bay Formation is gradational. The Queenston Shale is 440 to 500 feet thick in the Terra Cotta area, but thins somewhat northwards. It readily weathers to a red clay soil characteristic of the area beneath the Niagara Escarpment around Terra Cotta and Inglewood.

Cataract Group

The most important formation of the Cataract Group is the Whirlpool Sandstone. In Peel, the Whirlpool Sandstone rests unconformably (with a sharp break) on the Queenston Shale, and outcrops along the base of the Niagara Escarpment. The Whirlpool Sandstone is important because it is used for building stone, and for facing and refractory purposes (under the trade name of "Credit Valley Sandstone"). It is 10 to 15 feet thick, and is a thin- to massive-bedded, grey - to reddish-coloured quartzose sandstone. It is the basal formation of the Silurian system, and is unfossiliferous.

Overlying the Whirlpool Sandstone is the Manitoulin Dolomite, about 11 to 15 feet thick, and consisting of thick- to medium-bedded dolomite with shale partings and lenses of white chert. The Manitoulin Formation is fossiliferous; brachiopods being common in the chert lenses. There are also some corals and many scolecodonts.

The Cabot Head Shale Formation is about 35 feet thick and overlies the Manitoulin with which it is gradational. It outcrops sparingly in the face of the Niagara Escarpment. It consists of thinly-bedded, fissile grey-green shale with thin interbeds of grey- and rust-coloured calcareous sandstone and limestone/dolomite. The Formation appears to be of little commercial use. It is fossiliferous, since Bryozoa are common in the harder calcareous sandstone lenses.

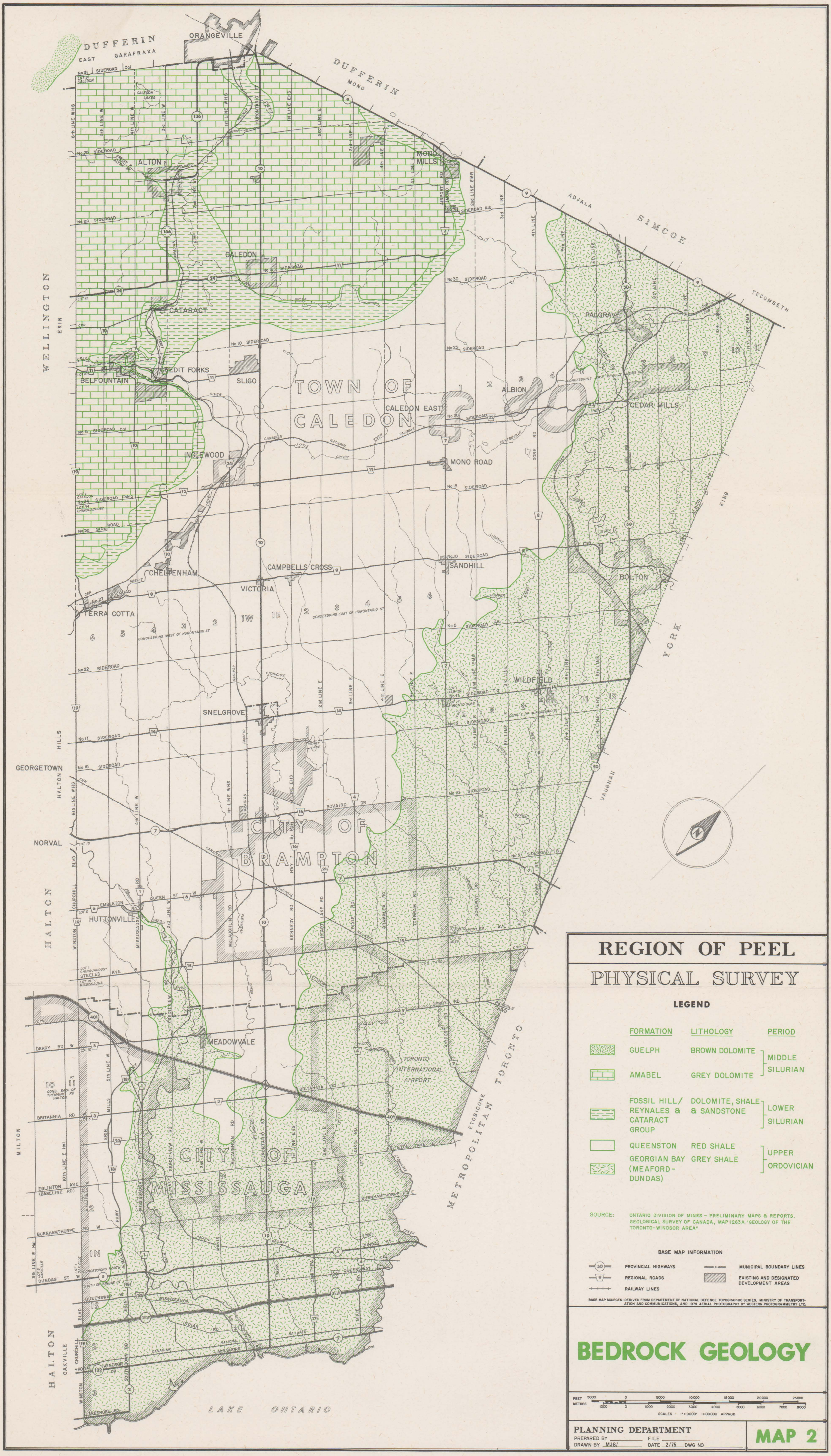
Clinton Group

Reynales - Fossil Hill Formation

The Fossil Hill Formation occurs between the Cabot Head Shale and the Amabel Dolomite. It is sparsely exposed in the Niagara Escarpment in Peel, but it is of interest because it appears to represent a transitional facies between the typical Fossil Hill Formation to the north and the Reynales Formation to the south (traceable from Limehouse in Halton Region to New York State). In Peel, the Reynales-Fossil Hill Formation is a dolomite 7 to 8 feet thick, which grades northwards from a grey, medium-bedded, fine argillaceous dolomite to a brown, crystalline dolomite rich in fossil corals, just southeast of Caledon.

Albemarle Group

The Amabel Dolomite forms the caprock of the Niagara Escarpment. Its resistance to erosion is largely responsible for the existence of the Escarpment. The Amabel Dolomite is not divisible into members in the Region of Peel. It consists entirely of light grey buff, medium to coarsly crystalline, generally massive-bedded and reefy fossiliferous dolomite. Fossils include crinoids, pelecypods, gastropods, brachiopods and cephalopods. Total thickness is probably greater than 130 feet (northwest corner of Peel), though the maximum thickness exposed in the Escarpment is 25 feet at Credit Forks. The contact with the overlying Guelph Formation (dolomite) lies about one-half mile outside the extreme northwest corner of the Region of Peel.



REGION OF PEEL

PHYSICAL SURVEY

LEGEND

	FORMATION	LITHOLOGY	PERIOD
▒	GUELPH	BROWN DOLOMITE	MIDDLE SILURIAN
▦	AMABEL	GREY DOLOMITE	
▤	FOSSIL HILL/ REYNALES & CATARACT GROUP	DOLOMITE, SHALE & SANDSTONE	LOWER SILURIAN
☐	QUEENSTON	RED SHALE	UPPER ORDOVICIAN
▨	GEORGIAN BAY (MEAFORD-DUNDAS)	GREY SHALE	

SOURCE: ONTARIO DIVISION OF MINES – PRELIMINARY MAPS & REPORTS. GEOLOGICAL SURVEY OF CANADA, MAP 1263A "GEOLOGY OF THE TORONTO-WINDSOR AREA"

BASE MAP INFORMATION

(50)	PROVINCIAL HIGHWAYS	—•—	MUNICIPAL BOUNDARY LINES
9	REGIONAL ROADS	▨	EXISTING AND DESIGNATED DEVELOPMENT AREAS
+++	RAILWAY LINES		

BASE MAP SOURCES: DERIVED FROM DEPARTMENT OF NATIONAL DEFENCE TOPOGRAPHIC SERIES, MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, AND 1974 AERIAL PHOTOGRAPHY BY WESTERN PHOTOGRAMMETRY LTD.

BEDROCK GEOLOGY

FEET 5000 0 5000 10000 15000 20000 25000
METRES 1000 0 1000 2000 3000 4000 5000 6000 7000 8000
SCALES - 1" = 9000' 1:100000 APPROX

PLANNING DEPARTMENT
PREPARED BY ____ FILE ____
DRAWN BY MJB/ DATE 2/75 DWG NO ____

MAP 2

CHAPTER V

SURFICIAL GEOLOGY AND GLACIAL HISTORY

Surficial geology concerns those generally unconsolidated deposits covering the bedrock. These are primarily of glacial origin, being less than one million years old, belonging to the Pleistocene era. Most of Peel is covered by a moderate to thick layer of glacial deposits (drift 533 feet thick has been intersected by drilling in a bedrock valley near Palgrave). The bedrock, however, is exposed at or near the surface in several localities, notably along the Niagara Escarpment. In the Region of Peel, the glacial deposits exposed at the surface, or just beneath the soil, date from the last glaciation (Wisconsinan), about 14,500 to 10,000 years ago. Recent sediments (i.e., post Pleistocene - generally less than 8,000 years old) are confined to present river alluvium and lake and bog deposits within the Region. These generally consist of minor sands, silts, clay, marl and organic muck, and are of limited extent and importance.

The Pleistocene deposits of Peel have been deposited as a result of the advance of ice from the northeast and the southeast. They result from a number of advances and retreats of the ice, and the reader is referred to the section of this Chapter on Glacial History for an understanding of the sequential deposition, character and location of these deposits.

Glacial material forms various tills, ice-contact stratified drift, kame moraines and outwash, outwash sands and gravels, end moraines; and lacustrine and deltaic deposits laid down in ancient glacial lakes. Glacial features include eskers, kames, kame-moraines, till plains and drumlins. Tills representing two advances of ice from the north have been recognized in northern Peel, and four tills representing ice advances from the south are recognized at the surface in the Region. Another two older southern tills possibly exist beneath the surface. A considerable area of Peel appears to be underlain by sands, gravels and silts deposited by meltwaters from one of the ice retreats. Map 3, Surficial Geology, shows the generalized distribution of these various glacial deposits in the Region of Peel.

Tills

Tills were deposited during ice advances. The so-called Northern Tills are attributed to movements of the Lake Simcoe ice lobe, and the Southern Tills to the Lake Ontario lobe. Drumlins were formed in the till plains with their long axes in the direction of the ice movement. The drumlins associated with the till plain areas northeast of the former Village of Caledon indicate a direction of ice movement from the northeast. In most other places, the drumlins are aligned roughly north-south, or south-southeast-north-northwest.

Northern Tills

Southwest of Mono Mills, a till referred to as the Newmarket Till (or Lower Northern Till) was deposited by a local advance of the Lake Simcoe ice lobe moving in a southwesterly direction. This Till is a light brown, sandy loam to loam with 10 - 40% gravel content where it occurs at and above the Escarpment. There are several drumlins oriented in a northeast and southwest direction, and also a couple of end moraine ridges referred to as the Singhampton Moraine.

The Upper Northern Till is very restricted in Peel, occurring only as a few isolated hilltop cappings in the extreme northeast corner of the Region. It is a light grey silty clay to silty clay loam, and is considerably younger than the Newmarket Till, being separated from it by varying thicknesses of sand, gravel, silts and clays of ice-contact stratified drift of the Oak Ridges Moraine Complex.

Southern Tills

The oldest Southern Till in Peel, which is attributed to an advance of the Lake Ontario ice lobe, is the Port Stanley Till, which occurs north and northwest of the former Village of Caledon. Drumlins are present, indicating a southeast to northwest direction of ice advance. This Till is believed to be the oldest surface glacial deposit in Peel, dated at about 14,500 years ago.

The next oldest Southern Till in Peel is the Wentworth Till. It occurs on top of the Niagara Escarpment and in a band from Credit Forks to south of Sleswick. It mantles the Escarpment in this area and is exposed in the road cut on Highway #10 just southeast of the former Village of Caledon. Here it forms part of the Paris Moraine and has a considerable gravel content as well as numerous lenses of well-sorted sands and gravels.

The next oldest till is the Halton Till. This is the most important till in Peel. It covers much of the Peel plain. The Halton Till is of variable thickness, often less than 25 feet, and in a few places in river cuts, it can be seen resting on sands and silts deposited prior to the advance of the Halton ice. The Halton Till is a brown loam to silt loam till.

Over a considerable area of central and eastern Peel, thin, discontinuous deposits of the Wildfield-Lacustrine Till Complex overlie the Halton Till. This material was apparently deposited in the temporary ponding of glacial meltwaters referred to as Lake Peel. There are varved clays and some deltaic sands associated with the Lake Peel deposits. Frequently, the lacustrine and till layers are interbedded in this complex. The deltaic sands associated with Lake Peel are generally thin, but in the lower elevations may thicken up to 20 feet. The area of sand around Huttonville is possibly a Lake Peel deltaic deposit.

End Moraines

End Moraines, deposited at the terminal position of ice advances, occur in several places, representing different ice positions at different times. The end moraines generally consist of material similar in composition to the till with which they are genetically related.

End moraines recognized in Peel are:

Gooseville Moraine (Wildfield Till)
Palgrave Moraine (Halton Till)
Paris Moraine (Wentworth Till)
Singhampton and Gibraltar Moraines (Newmarket Till)

Ice-Contact Stratified Drift: "Interlobate" Moraines

A large area of ice-contact stratified drift occurs in the northeast part of Peel in the former Township of Albion, and in the southern part of the former Township of Caledon. This area shows considerable morainal topography and consists of kame moraines, kames and outwash materials. There are also some end moraines of different ages (Paris and Palgrave Moraines), which, because of their contiguous geographic location and topography, are, for the purposes of this Report, grouped with the ice-contact stratified material, and the whole is referred to collectively as the Oak Ridges Moraine Complex.

Much of the ice-contact stratified material was probably deposited at the maximum advance of the Halton ice. However, some of the deposits in the north may be attributed to a southern advance of the Lake Simcoe ice lobe, and hence the Oak Ridges Moraine (excluding the Paris and Palgrave End Moraines) can be referred to as an interlobate moraine.

In the northwest of the Region of Peel, the Orangeville Moraine is another "interlobate" kame moraine consisting of ice-contact stratified drift, probably built up largely by the southern ice advance responsible for the Port Stanley Till.

Glaciofluvial Outwash

Glacial meltwater channels containing gravel and sand outwash material are important in northern Peel, notably in the former Township of Caledon. These old meltwater channels from the ice sheets extend from Orangeville and from Mono Mills through Caledon, Cataract, the Credit Forks area and westwards into Wellington County towards Erin. A younger meltwater channel, formed by runoff from the Halton ice at a later stage further to the southeast, occurs from the former Township of Albion through Caledon East, Inglewood, and possibly beneath the present Credit River recent alluvium to Terra Cotta and linking with the Georgetown meltwater channel system. There may also have been a link between the main Caledon meltwater channel and the Caledon East channel through Credit Forks and the Credit River Valley.

The meltwater channels are important sources of gravel and sand, although the Caledon East channel appears to contain more sand and less gravel and is more variable in composition than the Caledon and Orangeville system of meltwater channels.

Brampton Esker

In the centre of the Peel plain is the Brampton Esker. This Esker is over three miles long extending from north of Heart Lake to south of Highway #7 near Dixie Road. It is partly covered by a thin layer of Halton Till, sometimes only a few feet thick along the crest of the Esker. It forms a narrow ridge of low relief, in places associated with hummocky kame-like topography. In fact, the Esker may be partly of kame-outwash origin. It is possible that the Esker is related in age and deposition to the "interlobate" Oak Ridges Moraine of northern Peel. There are areas of ice-contact stratified materials in the northern part of the Peel plain, as well as indications of sands and gravels beneath the Halton Till in a trend north of the Esker toward the Oak Ridges Moraine. South of the Esker, it is possible that further sands exist. There is also some evidence to suggest that the sands beneath the Halton Till grade to silts and clays southward.

Glaciolacustrine Deposits

Located in the extreme south of the Region is an ancient shoreline marked by a low bluff in places. This is recognized as the shoreline of Lake Iroquois, an ancient glacial stage preceding the development of the present Lake Ontario. Lake Iroquois can be thought of as an enlarged Lake Ontario. Associated with glacial Lake Iroquois, which is the youngest glacial feature in Peel, are lacustrine beach and bay-mouth sand and gravel bars. In the past, these have provided important sources of sand and gravel, but they are now essentially exhausted.

Other examples of glaciolacustrine deposits in Peel are the varved clays and deltaic sands of glacial Lake Peel (referred to earlier in this Chapter).

Glacial History

Four major advances and retreats of the ice of the last ice age (Pleistocene epoch) have been recognized in North America. The ice retreats were marked by warm climatic conditions as warm or warmer than those of the present day. All of the glacial deposits exposed in the Region of Peel and in most of Southern Ontario were deposited during the last major glaciation. This last major period of glaciation is known as the Wisconsinan stage. Deposits representing the previous Illinoian glacial stage, Sagmoinian interglacial stage and early Wisconsinan glacial (Sunnybrook Till) stage have been recognized in excavations in the City of Toronto and in Woodbridge, and possibly underlie areas of Peel beneath the late Wisconsinan deposits. The varied glacial deposits of Southern Ontario result from advances, retreats and fluctuations of different parts or lobes of the Wisconsinan glacier. By 20,000 years ago, the ice of the Wisconsinan stage had reached its maximum extent, as far as southern Ohio. Roughly 16,000 years ago, deglaciation began in southern Ontario, and the first land appeared through the ice about 14,000 years ago northwest of Orangeville. The Wisconsinan or Laurentide ice sheet split into two lobes, one occupying the Lake Simcoe basin and the other the Lake Ontario Basin. This split occurred parallel to and north of the shore of present Lake Ontario more or less along the line of the Oak Ridges Moraine Complex.

All the surface glacial deposits in Peel are attributed to pulsations - minor readvances and retreats - and periods of stagnation of the Ontario and Simcoe lobes of the late Wisconsinan glacier. During the first stages of the ice retreat, meltwaters from the lobes flowed south and southwestwards into glacial Lake Whittlesey which covered southwestern Ontario. At this time, the ice of the Ontario lobe stabilized for a while along the Niagara Escarpment in Peel. The Caledon meltwater channel, with its copious quantities of gravel and sand, was formed at this time (from Mono Mills through Caledon and the Cataract/Credit Forks area).

The Ontario lobe then readvanced slightly and overrode the Escarpment west of Credit Forks, depositing the Paris Moraine about 12,800 years ago. The ice then retreated again and meltwaters formed the Caledon East meltwater channel which contains variable sand, but less gravel than the earlier Caledon meltwater channel complex. The date of the Brampton Esker is not clearly understood, but it may have been formed about this time by a stream within or at the bottom of the ice sheet.

A temporary warming of the climate then caused the Ontario ice lobe to retreat rapidly southeastwards across the Peel plain, clearing part of the Ontario Basin, and allowing the formation of glacial Lake Iroquois about 12,000 years ago. The outlet of Lake Iroquois was down the Hudson Valley, since ice still covered the St. Lawrence River Valley. The Lake Iroquois shoreline, which parallels present Lake Ontario a few miles inland, and the associated beach and bay-mouth bar deposits of sand and gravel date from this time. About 10,000 years ago, drainage took place down the St. Lawrence River Valley and gradual uplift of the land following removal of the weight of the ice caused the shore of Lake Iroquois to recede to the present position of Lake Ontario.

During the retreat of the ice southeastwards across the Peel plain area, a short-lived ponding of meltwaters occured associated with some minor fluctuations of the ice mass. This ponding is known as Lake Peel, and is responsible for the mixed deposits of varved clays, silts and Wildfield Till in eastern and central Peel, extending into King Township in York Region. The southern limits of Lake Peel are difficult to establish, presumably because of the rapid retreat of the ice. The various small deltaic sand deposits associated with Lake Peel, such as the sand area around Huttonville, were probably the result of streams and rivers draining into Lake Peel from the north and northwest.

As the ice cleared the Region, the present surface drainage took shape with the Humber, East Humber and Credit Rivers approximately following the old preglacial valleys.

The present or post-glacial drainage has had little overall effect on the glacial topography and landscape. It is noteworthy that all the (surface) glacial deposits and landscape of Peel were formed in a mere 2,500 - 3,000 years.

Table 5 below lists the glacial events and deposits in the Region of Peel in stratigraphic sequence.

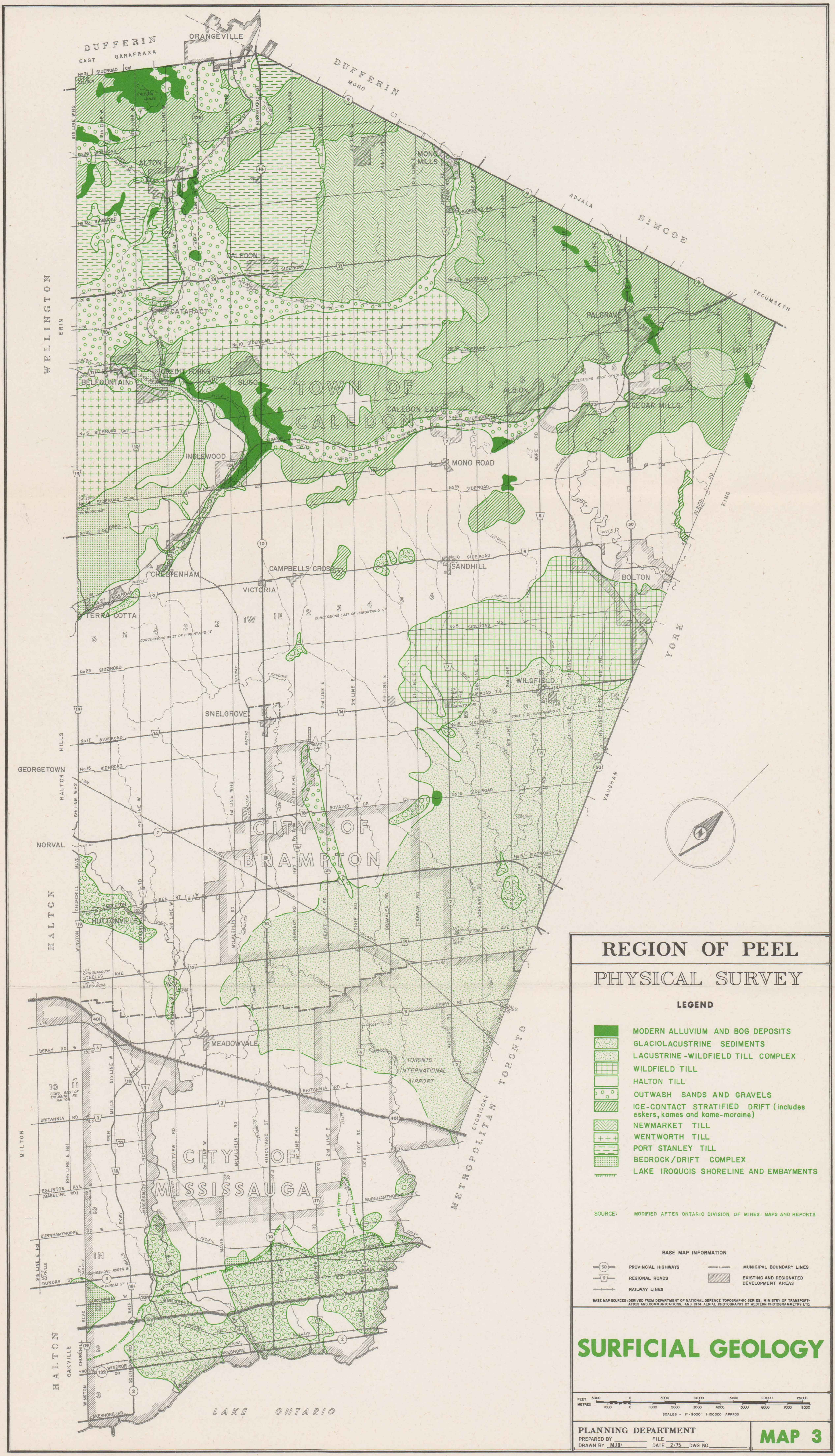
Table 5

PEEL GLACIAL HISTORY (LATE WISCONSINAN STAGE)

AGE (Years Before Present)	DEPOSIT OR FEATURE	GLACIAL ACTIVITY AND NOTES	LOCATION
14,500	Port Stanley Till	Advance of Ontario ice lobe. Oldest surface glacial deposit in Peel.	N.W. of Caledon, S.W. of Alton.
14,500	Orangeville "interlobate" Moraine	Kame moraine and outwash built up as end moraine by Port Stanley ice and/or interlobate between Port Stanley (Ontario Lobe) and Georgian Bay-Lake Simcoe Lobe.	W. & E. of Orangeville N. of Alton.
		Retreat of Ontario lobe.	
13,500	Newmarket Till, Singhampton Moraine	Re-advance of Simcoe lobe from N.E., overode Port Stanley Till and Orangeville Moraine in places. Drumlins present. Singhampton Moraine built up as end moraine in two parallel ridges.	S.W. of Mono Mills
13,000 to 12,800	Wentworth Till, Paris Moraine, Tills & sand beneath Halton Till*	Re-advance of Ontario lobe. Paris Moraine is end moraine of Wentworth ice (Ontario lobe)	Covers Escarpment south of former Village of Caledon. Occurs on top of Escarpment from S.W. of Credit Forks into Halton Region
	Caledon Meltwater Channel	Wentworth ice stagnant at Escarpment & Paris Moraine position for a few hundred years. Meltwaters produced rich gravel and sand outwash deposits of Caledon Meltwater Channel(s). Drainage west to Erin.	Mono Mills - Caledon Cataract - Belfountain - Erin
14,500 to 12,800	Upper Credit Meltwater Channels	Upper Credit River Meltwater Channel probably multi-age: post Orangeville Moraine to Wentworth time.	Orangeville - Alton - Cataract
12,800 to 12,500	Brampton Esker	Major retreat of Ontario lobe to southeast	Hwy. 7 at Dixie Road - Heart Lake
	Halton Till	Rapid re-advance of Ontario ice lobe deposited Halton Till (Peel till plain).	Peel Plain
	Oak Ridges Moraine	Ice-contact stratified drift of O.R.M. built up at max. advance of Halton Ice (Inc. Palgrave Moraine)+	Caledon - Albion Hills and Palgrave area.
12,500 to 12,300	Caledon East Meltwater Channel	Meltwaters of Halton ice as it stood near base of Escarpment before retreating drained S.W. to Georgetown. Sands and some gravels but less than in Caledon and Upper Credit Meltwater Channels.	Albion - Caledon E. - Inglewood - Terra Cotta
12,300	Wildfield Till & Gooseville End Moraine	Rapid retreat of Ontario lobe S.E. across Peel plain with short resurgences. A short but complex time.	Bolton & Gooseville (Gooseville Moraine)
	Lacustine - Wildfield Till complex (Glacial Lake Peel), inc. local deltaic sands (e.g. Huttonville)	Interbedded and mixed layers of clay till & lacustrine varved clays, silts & deltaic sands representative of fluctuating conditions & rapid sedimentation. Mostly below 750' elevation, dammed against ice at southeast.	Glacial Lake Peel covered much of east & central Peel Plain.
12,000	Lake Iroquois shoreline feature; beach and baymouth sand/gravel bars	Retreat of Halton ice (Ontario lobe) from Peel, clearing part of Ontario basin - Lake Iroquois with drainage down Hudson River.	Southern Mississauga (Approx. parallel to Hwy. 5)
10,500 to present	Thin sand veneer produced by recession of Lake Iroquois	Recession of ice from eastern Canada. Drainage down St. Lawrence Valley. Gradual uplift of land.	Southern Mississauga to present Lakeshore.

* Some till and sands beneath the Halton Till may be older than Wentworth age - note Sunnybrook Till of Early Wisconsinan age in Woodbrige cut, and Illinoian and Sagmoinian deposits at Toronto.

+ Some of the Oak Ridges Moraine Complex in the extreme north of Peel may be attributed to the Lake Simcoe lobe, thus making it a true interlobate moraine.



REGION OF PEEL

PHYSICAL SURVEY

LEGEND

■	MODERN ALLUVIUM AND BOG DEPOSITS
	GLACIOLACUSTRINE SEDIMENTS
	LACUSTRINE-WILDFIELD TILL COMPLEX
▦	WILDFIELD TILL
☐	HALTON TILL
	OUTWASH SANDS AND GRAVELS
▨	ICE-CONTACT STRATIFIED DRIFT (includes eskers, kames and kame-moraine)
	NEWMARKET TILL
+ + +	WENTWORTH TILL
	PORT STANLEY TILL
	BEDROCK/DRIFT COMPLEX
	LAKE IROQUOIS SHORELINE AND EMBAYMENTS

SOURCE: MODIFIED AFTER ONTARIO DIVISION OF MINES: MAPS AND REPORTS

BASE MAP INFORMATION

50	PROVINCIAL HIGHWAYS		MUNICIPAL BOUNDARY LINES
9	REGIONAL ROADS	▨	EXISTING AND DESIGNATED DEVELOPMENT AREAS
	RAILWAY LINES		

BASE MAP SOURCES: DERIVED FROM DEPARTMENT OF NATIONAL DEFENCE TOPOGRAPHIC SERIES, MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, AND 1974 AERIAL PHOTOGRAPHY BY WESTERN PHOTOGRAMMETRY LTD.

SURFICIAL GEOLOGY

FEET 5000 0 5000 10000 15000 20000 25000
METRES 1000 0 1000 2000 3000 4000 5000 6000 7000 8000
SCALES - 1" = 9000' 1:100000 APPROX

PLANNING DEPARTMENT
PREPARED BY ______ FILE ______
DRAWN BY MJB/ DATE 2/75 DWG NO ______

MAP 3

CHAPTER VI

PHYSIOGRAPHY AND TOPOGRAPHY

The Region of Peel is divided into major sub-regions by the Niagara Escarpment and the Oak Ridges Moraine Complex. The Oak Ridges Moraine Complex covers the northern part of Peel from the eastern boundary with York Region, north of Bolton, extending to Credit Forks. It largely buries or mantles the Niagara Escarpment from Credit Forks to Mono Mills, although the top of the Escarpment is exposed through this Moraine in several places east of the former Village of Caledon.

The area north and west of the Escarpment and the Oak Ridges Moraine is quite rugged and dissected with some fairly steep slopes. This area is fairly complex in detail, but broadly consists of till plains with drumlins, end moraines, the Orangeville Moraine, (an interlobate kame-moraine), and large irregular glacial meltwater channels. The two-thirds of the Region south of the Escarpment-Oak Ridges Moraine is till plain of smooth to gentle relief, sloping gradually towards Lake Ontario.

Topography

The Peel plain gradually rises from the Lake Ontario shore at 246 feet above sea level north and northwestward to nearly 1,000 feet at the base of the Niagara Escarpment and Moraine Upland area (refer to Map 5). There are small rivers, notably the Credit River, Etobicoke Creek, Mimico Creek, and Humber River draining southeast across the Peel plain. In places, the larger streams have cut fairly narrow steep-sided valleys up to 75 feet below the till plain.

Relief varies from approximately 275 feet near Terra Cotta to roughly 500 feet in vertical cliffs at Credit Forks. The Inglewood to Cataract area probably provides some of the most spectacular scenery in Peel, notably where the Credit River forms a re-entrant into the Escarpment at Credit Forks.

The relief associated with the Oak Ridges Moraine Complex, although less pronounced than the Escarpment, nevertheless forms a marked contrast to the Peel plain, rising fairly abruptly to form the hummocky relief of the Caledon and Albion Hills, about 300-400 feet above the plain.

Above the Escarpment, in the northwest corner of the Region, topography is varied. Some parts show dissected, rugged to hilly morainal topography (e.g., Orangeville Moraine, Singhampton Moraine); other areas are of more gentle relief on till plains and meltwater channels. The highest point in the Region is 1600 feet in the extreme northwest corner in the Orangeville Moraine. There are many small swamps and ponds in this area.

Physiography

The broad landform divisions of the Region of Peel are subdivided into physiographic units and features as shown on Map 4. With the exception of the Niagara Escarpment, the present landforms are almost entirely the result of the last glaciation (Wisconsinan) of the ice age. The present physiography thus closely corresponds with the Pleistocene geology.

A brief glacial history is given in Chapter V, to which the reader is referred for background in understanding present Peel landforms, scenery and surficial geology. Suffice it to mention here that 20,000 years ago, this area, along with all of Southern Ontario and as far south as Southern Ohio, was under a huge ice sheet - probably in excess of a mile thick. As the ice advanced, it brought with it material from the Canadian Shield, as well as gouged-out and ground-up bedrock from the local area. Most of the land features of Peel are the result of material (rocks, gravel, sand, clays, etc.) dumped by the ice, or meltwaters from the ice, as it advanced and retreated.

Niagara Escarpment

The Niagara Escarpment is a remnant of the preglacial landscape. It forms a marked topographic feature from the Peel-Halton border at Terra Cotta north to Credit Forks, where the Credit River forms a re-entrant in the Escarpment. North-eastwards from Credit Forks, it is mostly mantled by glacial drift of the Paris Moraine and other moraines referred to collectively as the "Oak Ridges Moraine Complex". The Escarpment underlies the drift south of the former Village of Caledon (Highway 10 climbs the covered Escarpment two miles southeast of the former Village of Caledon), but there are a few exposures of dolomite bedrock representing the crest of the Escarpment in Lots 12 and 13, Concessions 3, 4 and 5 East (former Township of Caledon), and in places from Sleswick to Mono Mills.

Definition of the Escarpment

An escarpment is a steep slope or cliff of relatively great length, presented by the abrupt termination of strata, formed by the process of differential erosion of a competent (hard) rock formation underlain by incompetent (softer), more easily eroded strata.

In the case of the Niagara Escarpment, the competent stratum or cap rock is the Amabel dolomite, while the underlying incompetent strata belong to the Cataract Group of shales and limestone and the Queenston shale. The brow or edge of the Escarpment is where there is an abrupt change in slope from gentle to steep at the top. The face is that part (slope and cliffs) between the brow and the base. In places it is difficult to pinpoint the brow and the base and so define the physical Escarpment, especially where the overall slope is less pronounced, where it is composed of multiple subparallel small scarps or "steps" and irregular slopes, and where the bedrock Escarpment is mantled or buried by glacial drift. The Niagara Escarpment Commission is working on resolving these difficulties, but has not yet precisely defined the Escarpment on a map.

The term "Escarpment" is used here to refer to the whole zone between the Amabel dolomite and the base of the steep slope at or below the Whirlpool Sandstone. It may be an abrupt cliff, as at Credit Forks, or a more gentle rise with or without some exposed bedrock scarps, as in the vicinity of Caledon Mountain (where gradients are gentle to moderate, approximately 4 degrees). Where the slope is buried, as south and east of the former Village of Caledon, the Escarpment is indefinite. For the purposes of this Report, the Escarpment is defined as the area from the Amabel dolomite position beneath the drift to the bottom of the steepest slope in the drift, in the vicinity of, but not necessarily precisely conforming to, the buried rock Escarpment slope. On Maps 4 and 21, the Escarpment is indicated by a symbol representing the generalized trend of crests of scarps (or"steps") comprising the Escarpment.

The only other remnants of the preglacial landscape may be represented by the present courses of parts of the Credit and Humber Rivers, which probably conform to preglacial river valleys (now filled with Pleistocene sediments).

Glacial Landforms of Northern Peel

The Oak Ridges Moraine Complex forms the hummocky to hilly land stretching from Credit Forks, through the northern part of the former Township of Albion into northern York Region. It forms the Caledon and Albion Hills. The area of northwestern Peel on top of the Escarpment contains several different landforms. The area north of the former Village of Caledon and west of Sleswick is a till plain with drumlins and end moraine ridges (Singhampton

Moraine). North of Alton and southeast of Orangeville are areas of hilly topography with fairly steep slopes, being parts of the Orangeville Moraine - an interlobate kame-moraine with some similarities to the Oak Ridges Moraine. South of Alton are more areas of till plain with drumlins. The top of the Escarpment between Credit Forks and north of Terra Cotta is covered with a till and end moraine (Paris Moraine), which again forms some rolling to hilly country. Between these various areas of drumlinized till plains, end moraines and kame-moraines, in northwestern Peel, are important glacial spillways or meltwater channels. These are characterized by fairly smooth topography, generally of somewhat lower elevation than the areas of hilly moraine. Present river and stream valleys (such as the Credit River) often follow the old glacial meltwater channels.

The two prominent glacial meltwater channels extend as follows: one from Mono Mills to just south of the former Village of Caledon and westwards through Cataract to Erin in Wellington County; the other from the former Township of Albion through Caledon East to Inglewood.

South of the Upland area of northern Peel, the Peel plain slopes gently southeast towards Lake Ontario. The Peel plain is a till plain of smooth to gentle relief. There are a few rather poorly defined drumlins in the western part of the plain. A large part of the Peel plain in eastern Peel (from south of Bolton approximately through Wildfield, Tullamore, the former Town of Brampton, Derry West and the south end of Toronto International Airport) is a glacial lake plain (Glacial Lake Peel). It is essentially a very gently sloping, smooth lacustrine clay plain with some till and occasional deltaic sands. The present drainage system of the Etobicoke Creek and of the West Branch of the Humber River have shallowly dissected this area.

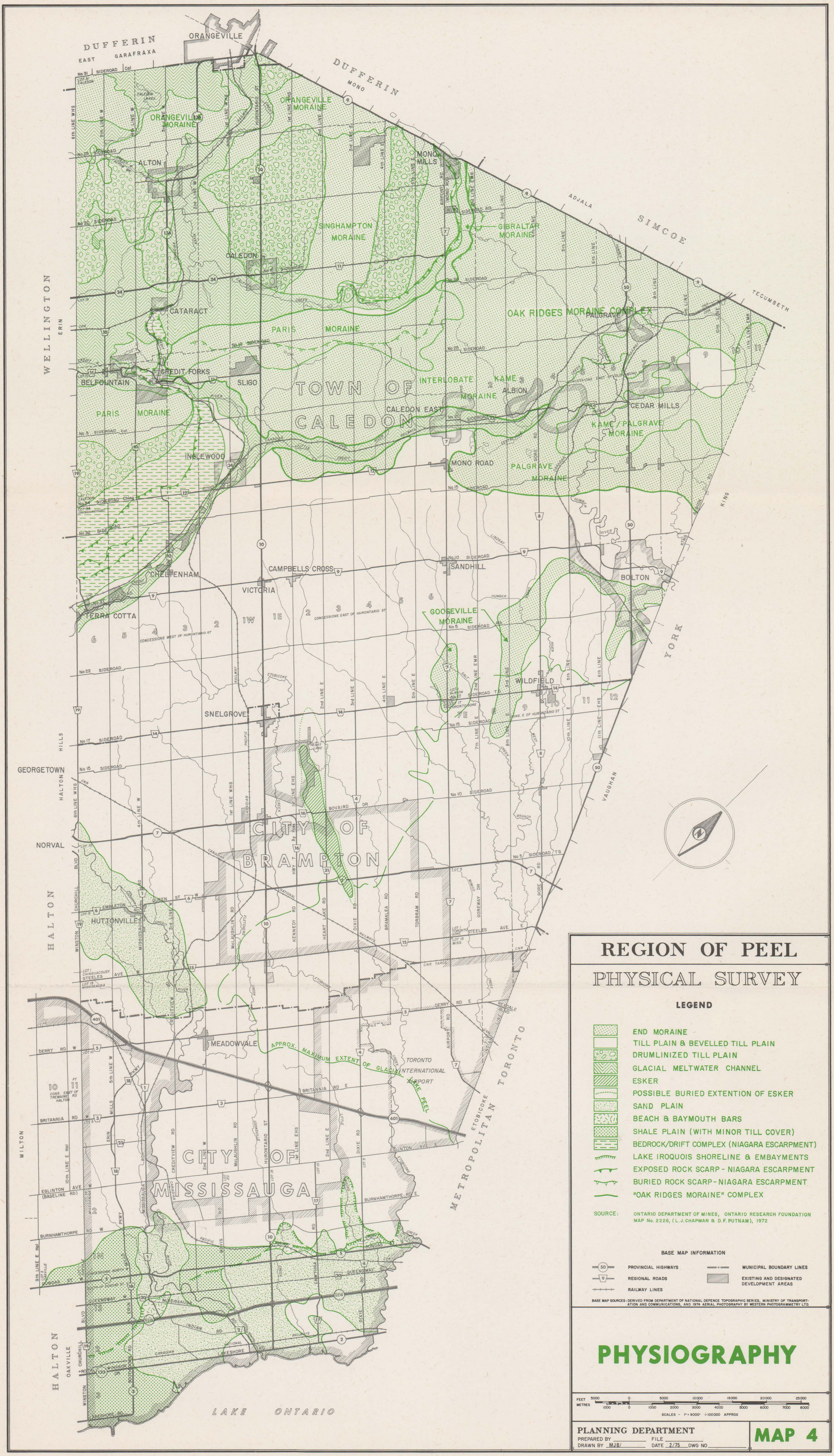
Around Huttonville, and in the extreme south of the Peel plain near the lakeshore, are sand plains overlying the till. These are attributed to glacial lacustrine beach or deltaic deposits. The area of sand around Huttonville has an elevation of approximately 700 feet and may represent a delta into glacial Lake Peel. The sandy areas shown in the extreme south are associated with old Lake Iroquois (see Glacial History in Chapter V). The Lake Iroquois shoreline is marked by a low bluff or gentle slope two to three miles inland from the Peel-Halton border (Highway 19) just north of the C.N.R. line to Erindale, and then roughly parallel to Highway #5 to the Peel boundary with the Borough of Etobicoke. Locally important beach and bar deposits of gravel and sand occur in the old Lake Iroquois shoreline, but these are now largely exhausted or urbanized (refer to Chapter VII).

In parts of the southern Peel plain, the glacial Halton Till is very thin and in places the soil appears to derive directly from the underlying shale, notably south of Streetsville. Chapman and Putnam classify this area as a "shale plain".[1]

Perhaps the most important feature of the Peel plain is the Brampton Esker. This feature is partly buried by a few feet of Halton Till over its crest, but it forms a ridge of low relief, associated with some hummocky kame-like topography in places. It can be traced more than three miles from north of Heart Lake, crossing Heart Lake Road and Highway #7 (just west of Dixie Road), approximately to the Northern Electric Plant immediately west of Dixie Road and a few hundred yards southwest of Bramalea City Centre. It is the only esker known in the Region, and is an important geologic feature and sand and gravel reserve.

REFERENCE NOTE

[1] L. J. Chapman and D. F. Putnam, "Physiography of the South Central Portion of Southern Ontario," Map 2226, Ontario Department of Mines and Northern Affairs, 1972.



REGION OF PEEL

PHYSICAL SURVEY

LEGEND

- ▨ END MORAINE
- ☐ TILL PLAIN & BEVELLED TILL PLAIN
- ▨ DRUMLINIZED TILL PLAIN
- ▨ GLACIAL MELTWATER CHANNEL
- ▨ ESKER
- ☐ POSSIBLE BURIED EXTENTION OF ESKER
- ▨ SAND PLAIN
- ▨ BEACH & BAYMOUTH BARS
- ▨ SHALE PLAIN (WITH MINOR TILL COVER)
- ▨ BEDROCK/DRIFT COMPLEX (NIAGARA ESCARPMENT)
- LAKE IROQUOIS SHORELINE & EMBAYMENTS
- EXPOSED ROCK SCARP - NIAGARA ESCARPMENT
- BURIED ROCK SCARP - NIAGARA ESCARPMENT
- "OAK RIDGES MORAINE" COMPLEX

SOURCE: ONTARIO DEPARTMENT OF MINES, ONTARIO RESEARCH FOUNDATION MAP No. 2226, (L.J. CHAPMAN & D.F. PUTNAM), 1972

BASE MAP INFORMATION

- PROVINCIAL HIGHWAYS
- REGIONAL ROADS
- RAILWAY LINES
- MUNICIPAL BOUNDARY LINES
- ▨ EXISTING AND DESIGNATED DEVELOPMENT AREAS

BASE MAP SOURCES: DERIVED FROM DEPARTMENT OF NATIONAL DEFENCE TOPOGRAPHIC SERIES, MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, AND 1974 AERIAL PHOTOGRAPHY BY WESTERN PHOTOGRAMMETRY LTD.

PHYSIOGRAPHY

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METRES 1000 0 1000 2000 3000 4000 5000 6000 7000 8000
SCALES - 1" = 9000' 1:100000 APPROX

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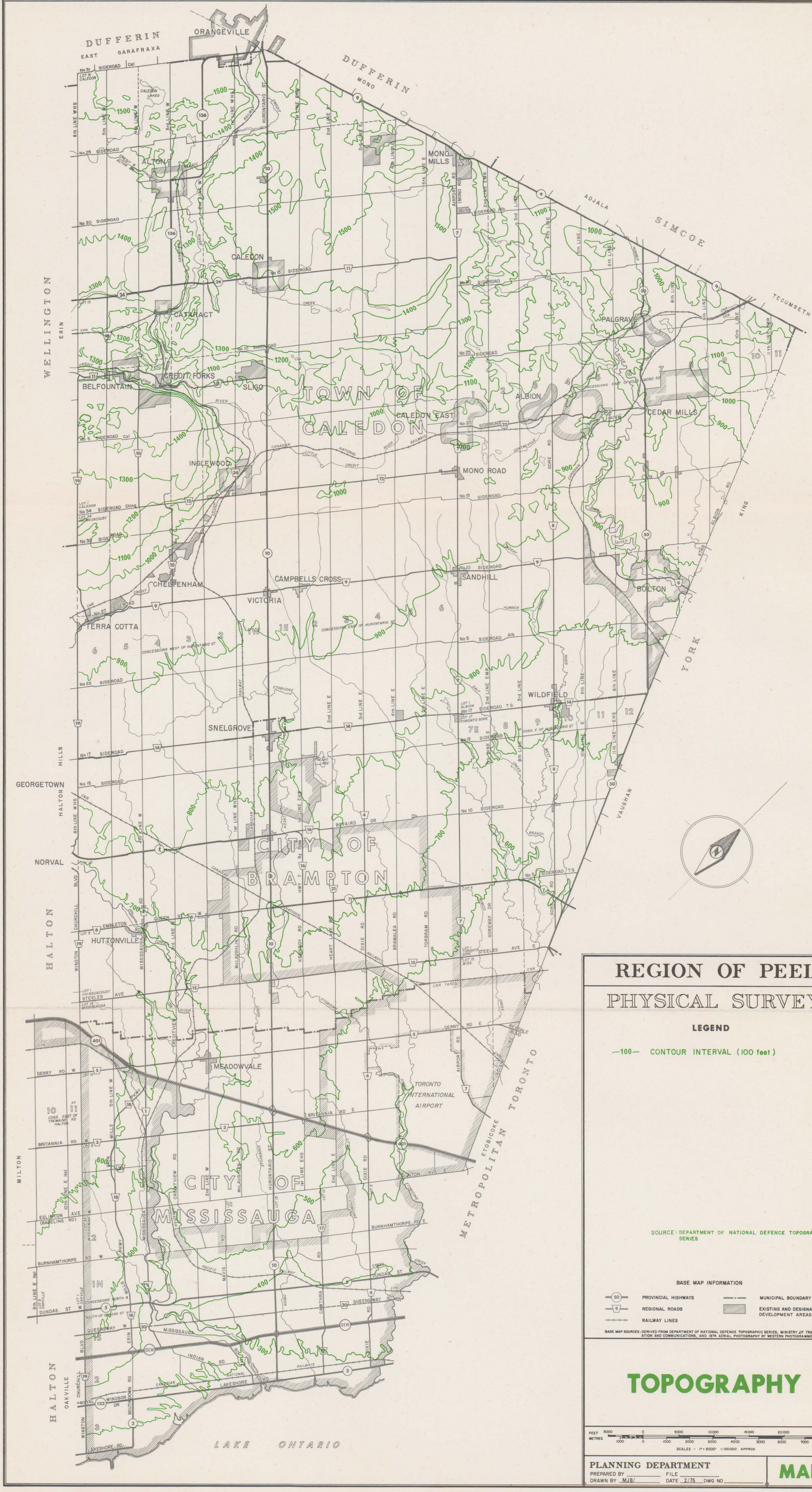
DRAWN BY MJB/ DATE 2/75 DWG NO ________

MAP 4



REGION OF PEEL

PHYSICAL SURVEY

LEGEND

—100— CONTOUR INTERVAL (100 feet)

SOURCE: DEPARTMENT OF NATIONAL DEFENCE TOPOGRAPHIC SERIES

BASE MAP INFORMATION

⑤⓪	PROVINCIAL HIGHWAYS	—·—	MUNICIPAL BOUNDARY LINES
9	REGIONAL ROADS	▨	EXISTING AND DESIGNATED DEVELOPMENT AREAS
+++	RAILWAY LINES		

BASE MAP SOURCES: DERIVED FROM DEPARTMENT OF NATIONAL DEFENCE TOPOGRAPHIC SERIES, MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, AND 1974 AERIAL PHOTOGRAPHY BY WESTERN PHOTOGRAMMETRY LTD.

TOPOGRAPHY

FEET 5000 0 5000 10000 15000 20000 25000
METRES 1000 0 1000 2000 3000 4000 5000 6000 7000 8000
SCALES - 1" = 9000' 1:100000 APPROX

PLANNING DEPARTMENT

PREPARED BY ________ FILE ________
DRAWN BY MJB/ DATE 2/75 DWG NO ________

MAP 5

CHAPTER VII

MINERAL RESOURCES

The mineral resources of the Region of Peel consist of unconsolidated sand and gravel and consolidated stone or hardrock, which are vital resources for the construction industry. There are no known or suspected oil and gas reserves or metalliferous minerals in Peel.

Sand and Gravel Reserves

As mentioned in Chapters V and VI, the sand and gravel deposits of the Region of Peel occur by courtesy of the Pleistocene ice mass and associated meltwaters. Only very minor deposits of sand and gravel exist in recent river alluvium or present lakeshore beaches, and these are economically insignificant.

Of the glacial deposits in Peel, by far the most important sources of sand and gravel are meltwater channels filled with gravel and sand outwash material. Kame and kame-outwash deposits of sand and gravel may also be locally important in the Orangeville and Oak Ridges Moraines, but such deposits are likely to be irregular and discontinuous (in pockets). The Brampton Esker is also an important source of sand and gravel, although its producing lifespan is now limited. Other sand and gravel occurrences are of very limited significance from a Regional reserve viewpoint. These other occurrences include local glaciolacustrine or outwash deposits in the Peel plain and the Lake Iroquois shore bar and beach deposits, which are now largely depleted or urbanized.

The accompanying Sand and Gravel Reserve Map (Map 6) illustrates the distribution of estimated reserves rated in order of importance (high, medium and low potential, and non-existent). It is emphasized that this Map is generalized; boundaries are approximate; and reserves do not take into account present or past mining operations, which in some cases have largely worked out the potential reserves in the area of the pit. No drilling has been carried out to test these reserve estimates. Map 6 has been compiled with the assistance of staff of the Phanerozoic Geology Section, Division of Mines, Ontario Ministry of Natural Resources; and through the use of published maps and reports, and related studies by Gartner Lee Associates, Consulting Engineering Geologists. It is hoped that further studies will soon be undertaken to increase the knowledge of sand and gravel reserves in the Region of Peel, and to delineate them more accurately. Map 6 and these notes are intended as general guides only.

As can be ascertained from Map 6, by far the most extensive and richest reserves of sand and gravel occur in the former Township of Caledon. These reserves are of importance not only from a Regional viewpoint, but also from a Provincial one, since they are among the best reserves in Central Ontario. The former Township of Caledon is estimated to contain in excess of 767 million tons of gravel, and is the richest Township, in terms of estimated gravel reserves, in the Central Ontario Region. Most of this huge reserve in the former Township of Caledon occurs in the glacial meltwater channel deposits and, to a lesser extent, in kames and outwash in the Orangeville and Oak Ridges Moraines. The richest meltwater channel appears to be the one through the former Village of Caledon, Cataract and Belfountain to the Peel-Wellington border, with a branch from Orangeville through Alton. A separate channel from the former Township of Albion through Caledon East to Inglewood appears to carry less gravel.

The Brampton Esker is, or was, an important gravel reserve for Peel and Toronto. Eleven pits have been opened between Heart Lake and just south of Highway #7 (many are now inactive). In common with most eskers, the Brampton Esker is of considerably variable composition, with varying ratios of gravel to sand and varying sizes and compositions of gravel. Generally speaking, the centre of the Esker carries proportionately more gravel, which grades laterally to cross-bedded stratified sand. At least in its southern half, the western boundary of the Esker appears to be quite sharply defined, but there is some suggestion that at least sand extends somewhat eastward and northward at depth beneath the Halton Till. There is also a suggestion of a possible link with granular material at depth between the kame moraine-outwash material of the Oak Ridges Moraine Complex and the Brampton Esker in a northwest-southeast trend. It is unknown what happens south of the Brampton Esker at depth. Although largely depleted, there is still an estimated nine million tons of gravel and sand left in the Esker proper (1974 estimate). Areas of remaining reserves are in abandoned pits (some below the water-table), between pits, and in the vicinity of the old Brampton water wells. Additional reserves may occur around and north of Heart Lake. Elsewhere in the former Township of Chinguacousy, sand and gravel reserves are insignificant from a Regional standpoint. A local area of glacial outwash and/or deltaic sands and gravels was previously mined east of the Brampton Esker in Lot 10, Concession V E.H.S., former Township of Chinguacousy. The deltaic or glaciolacustrine sand ponding around Huttonville consists mostly of fine sand and silty sand, and is unimportant.

In Mississauga, the Lake Iroquois shore beach and baymouth bar deposits of sand and gravel were important, but most have been depleted and are now urbanized. However, a large and deep (20-40 feet thick), bar at Erindale by the Credit River is still being mined. There is a small reserve of gravel, and a moderate to large reserve of sand remaining in this baymouth bar. Local lenses of glaciolacustrine or outwash sand and gravel in Lots 2 and 3, Concessions I and II E.H.S. (south of Highway #401 and east of Highway #10), and the area of "sand plain" associated with the receding Lake Iroquois in southern Mississauga are insignificant from a Regional viewpoint. The "sand plain" is essentially a thin veneer of sand perhaps only a few feet deep on till or shale. Reserves in Mississauga are estimated at 0.5 million tons.

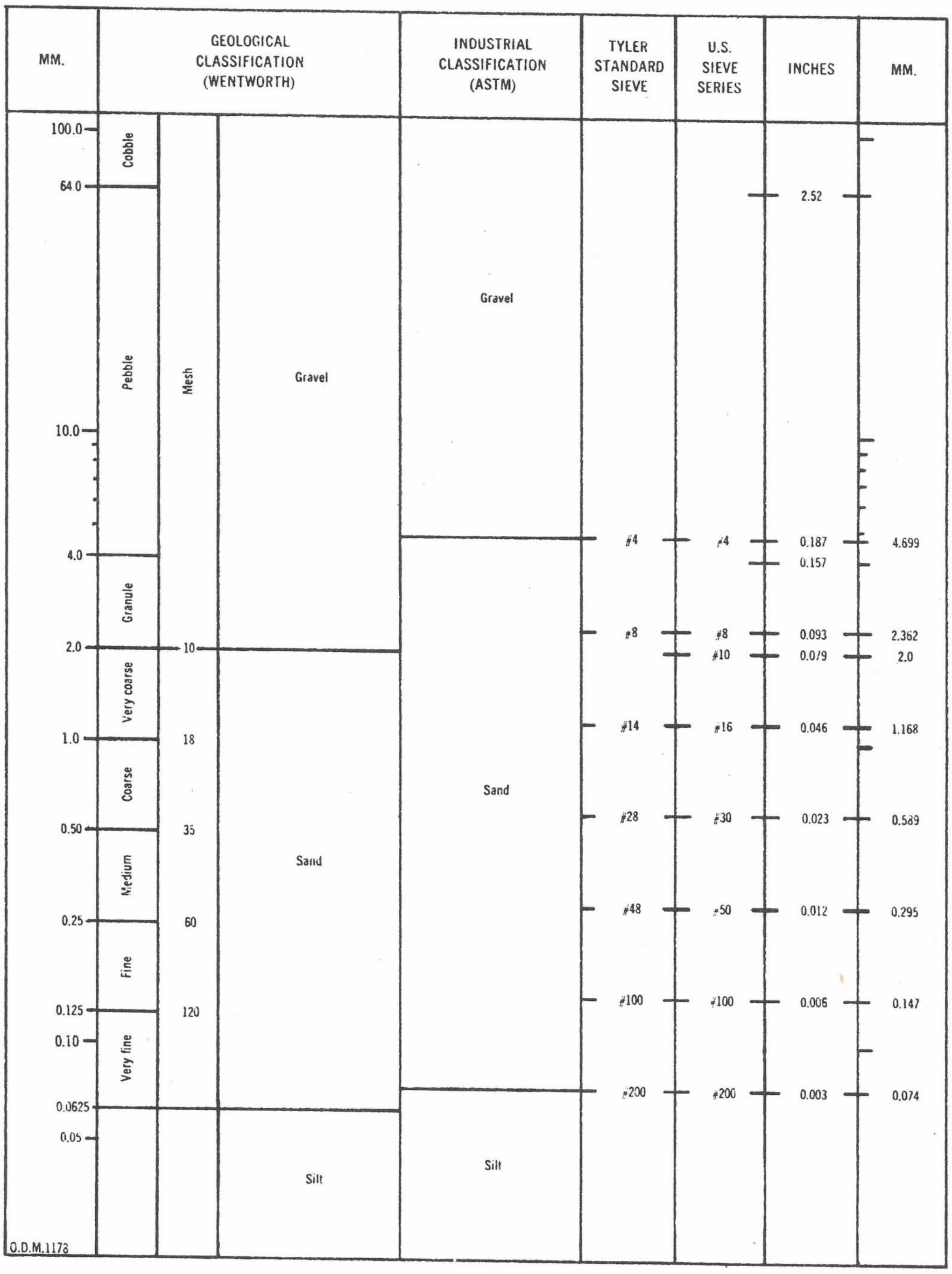


Table 6 Geological and Industrial Classifications of sand and gravel, showing common sieve-sizes in inches and millimetres.

Source: Industrial Mineral Resources Report 11 Ontario Department of Mines.

Total sand and gravel reserves in the Region of Peel are estimated at 777 million tons (Mineral Aggregate Study: Central Ontario Region, Proctor and Redfern Limited, 1974). This figure might be considered somewhat conservative.

Clay

Clay is not an important resource in Peel, although there may be deposits associated with the tills and glaciolacustrine deposits which could be suitable for local extraction. At the Streetsville quarry of Canada Brick Limited, 100 feet of yellow-grey clay till overlies quarried Queenston Shale, and both clay and shale are used in brick manufacture.

Hard Rock Resources

The term "hard rock" is used synonomously with "bedrock" to mean all consolidated rock either beneath the glacial drift overburden, or exposed at the surface. In Peel, the bedrock consists of shales, dolomites and sandstone of Palaeozoic age. Where exposed or covered by only a thin mantle of glacial overburden, these rocks can be, and are, quarried for constructional and industrial uses. The properties and uses of the bedrock formations of commercial interest in Peel are dealt with later in this Chapter.

Areas Suitable for Quarrying

Not everywhere where commercially useful bedrock occurs beneath the surface is quarrying economical. The geographic location is important, taking into consideration the height of the water-table and drainage problems. Important too is the specific local quality of the rock, since variations in chemical composition and physical properties can and do occur within an apparently uniform formation. Economically important is the location with respect to markets; transportation being a costly part of all aggregate, stone and sand/gravel production. From a mining point of view, all of Peel is well located with respect to markets, and access everywhere is excellent.

Perhaps the major natural limiting factor to mining of the shales, dolomite and sandstone of the Region is the mantle of glacial overburden which covers most of this area. Under present economic conditions, it is generally feasible to remove up to 25 feet of overburden for a quarrying operation. Areas with less than 25 feet of overburden are therefore considered to offer good potential for bedrock mining in Peel. Removal of up to 50 feet of overburden may become economic under certain conditions, and areas with up to 50 feet of overburden are therefore considered "possible" for quarrying. Areas where the overburden thickness is greater than 50 feet are not considered to have potential for quarrying.

Most of the quarries in Peel have been in operation for many years (there are also some abandoned quarries), and are located where the bedrock outcrops (i.e., in areas with<10 feet of soil and/or drift and rock outcrops at the surface).

The accompanying Depth to Bedrock Map (Map 7) illustrates the variability in thickness of the glacial deposits, and shows those areas of "good" (less than 25 feet of overburden) potential and "possible" (25-50 feet of overburden) potential for hard rock mining by open cast methods. It should be noted, however, that this Map is generalized. There may be local areas within the 25-foot contour, which are less suited or unsuitable for quarrying, because the depth to bedrock is greater than 25 feet.

When the Depth to Bedrock Map (Map 7) is superimposed on the Bedrock Geology Map (Map 2), the broad areas suited to quarrying can be ascertained. Several areas of southern Peel might be suitable for mining Meaford-Dundas Shale and Queenston Shale, while some areas on top of the Escarpment in northern Peel could be mined for dolomite.

Formations of Commercial Interest

Meaford-Dundas Shale (Georgian Bay Formation)

Meaford-Dundas Shale is the bedrock of much of southern and eastern Peel. One large quarry (Domtar Construction Materials Limited) at Cooksville produces material from the Humber member of the Dundas Shale for the manufacture of brick, tile and expanded aggregate (Haydite). Three other quarries produce from the Dundas Shale in the Toronto area. The Humber member apparently contains a somewhat greater proportion of hard, sandy and calcareous layers and lenses than the underlying Danforth and Rosedale members.

As a raw material for brick and tile manufacture, Dundas Shale has just enough workability for modern extrusion equipment. It burns red and has a rather short firing range. Sandy hard layers reduce the plasticity of the shale and limy ones weaken the burned red colour. It is desirable, therefore, to remove as many fragments as possible from the plant feed. Lime varies from about 3 to 7 percent and iron from 5.75 to almost 7 percent. The Dundas Shale consists of approximately 60 percent clay minerals (illite and chlorite). Gypsum has not been observed, but white efflorescence is usually common on weathered exposures of the shale. Pyrite occurs in trace amounts. Barium carbonate is usually added to the plant feed to control scumming. Dundas Shale bloats well before the fusion point, but the shape of the coated aggregates produced is poor. It is satisfactory for the manufacture of crushed sintered aggregate.

There are several areas in southern and eastern Peel, with less than 25 feet of overburden, which might be suited to quarrying for Meaford-Dundas Shale.

Queenston Formation

The Queenston Formation is used for brick and tile manufacture. It underlies parts of central and northern Peel between the Meaford-Dundas Shale and the Niagara Escarpment. It is a brick red, thin to thick bedded, sandy and argillaceous shale. Unweathered Queenston Shale has a fairly short firing range and light red fired colour. Weathered Queenston Shale has a longer firing range and a deeper red fired colour. Plasticity of the unweathered shale is only just adequate for modern extrusion equipment. The Queenston Shale is quite uniform in its chemical and mineral composition. Lime is the most variable constituent with a range of 3.2 to 17.7 percent. Iron ($Fe_2 O_3$) ranges from 4.5 to 7.4 percent. The lime content largely determines the colour and porosity of the fired ware. Gypsum occurs in trace amounts throughout the Queenston Formation and is an undesirable constituent. It occurs in discrete units, either in nodules (and also botryoidal masses), or in thin tabular sheets. Selective quarrying and hand sorting can be used to reduce the content of gypsum in the feed to the plant, but the addition of barium carbonate is necessary for complete efflorescence control. The Queenston Shale is quarried for brick and tile manufacture at three localities in Peel. There is at least one abandoned quarry.

Some sections of the Queenston Shale exhibit moderate to good bloating characteristics and would be suitable for making a sintered aggregate, but the shale is unsuited for coated aggregated.

Several places in southwest and central-west Peel show exposures of Queenston Shale, or have only shallow overburden above the Shale, and could be suitable for exploitation.

Whirlpool Sandstone

The Whirlpool Sandstone, also known by the trade name "Credit Valley Sandstone", outcrops at the base of the Niagara

Escarpment in places between Terra Cotta and Credit Forks. Its light grey to brownish-red colour, hardness and massive-bedded nature, make it an excellent building and decorative stone. Many older public buildings in Toronto are built of Whirlpool Sandstone. It is only 12 to 15 feet thick, occurring at the base of the Escarpment and dipping gently beneath a considerable thickness of overlying dolomites and shales, and consequently, its potential for large-scale exploitation is limited. Southwest and west of Inglewood, in Concession III W.H.S. (former Township of Caledon), the Whirlpool Sandstone outcrops as a broad ledge about a half mile wide at the base of the Niagara Escarpment. It is here, and also near Terra Cotta, that the sandstone is quarried by several small quarrying operations on four licensed properties.

Cabot Head Formation

The Cabot Head Formation is predominately a shale which is generally suitable for the production of brick, tile and expanded aggregate. It occurs in the face of the Niagara Escarpment, but there is no mining of this formation, partly because suitable exposures are scarce, and partly because other shales are more accessible.

Amabel Dolomite

Crushed dolomite is used for concrete aggregate, roads (road metal), railroad ballast and sewage filter beds; and in finer form for poultry grit, stucco, manufactured sand, filler and whiting. It is used as a fluxing agent in metallurgical smelting, as a soil conditioner, as a source of lime (which has a long list of industrial applications), as a chemical raw material in glass making, acid neutralization and other processes; and as a building stone. Dead-burned dolomite, which is dolomite calcined at high temperatures, is used as a refractory material in lining metallurgical furnaces.

In Peel, there are several areas of light overburden north and west of the Niagara Escarpment, which might be economically suited to mining of dolomite. From the Peel boundary at Terra Cotta to approximately Lots 3, 4 and 5, Concession III (former Township of Caledon), a strip approximately a half mile to one mile wide above the Escarpment has less than 25 feet of overburden. The thickness of the Amabel Dolomite and the level of the ground increase to the west here, but at high elevations, thick overburden deposits of the Paris Moraine occur. Between Cataract and Alton, notably along and west of Highway #24, is an area of thin overburden (10-25 feet) with several areas of bedrock outcrop. Here the Amabel Dolomite is at least 100 feet thick. This might be one of the most favourable localities for dolomite quarrying in the Region. (Note the presence of a spur of the Canadian Pacific Railroad in the vicinity.)

Between Cataract and the vicinity of the former Village of Caledon, the overburden consists largely of meltwater channel sands and gravels with thicknesses often less than 50 feet. However, the Amabel Dolomite in this area is probably generally thin, with the underlying Cabot Head Shale near to the bedrock surface. Quarrying of the dolomite in this area, and to the northeast of the former Village of Caledon, therefore, is probably ruled out. (However, it should be noted that the bedrock topography* is not well known in detail in northwestern Peel.)

About three miles east of the former Village of Caledon (Lots 13 and 14, Concessions III and IV, former Township of Caledon), Amabel Dolomite outcrops north of Star. Little is known about drift thicknesses in this general area, although generally speaking, the whole area between Mono Mills and Star probably is relatively shallowly covered by overburden (Refer to Map 7). Above the Escarpment between Sleswick and Mono Mills (west of Airport Road), there may be up to 100 feet of dolomite beneath fairly shallow drift, although here again not much information is available on drift thicknesses.

According to the Mineral Aggregate Study: Central Ontario Region (Proctor and Redfern Limited, 1974), there exist approximately

* Refer to Map 8.

1,300 million tons of economic reserves of Amabel Dolomite in the Region of Peel (all in the former Township of Caledon). No estimate is made of reserves of shales, but the natural accessible reserves (disallowing any restrictive cultural effects) are believed to be enormous.

Present Production (Existing Pits and Quarries)

The term "pit" is used for any open cast mining of unconsolidated gravels, sands or clay. A "quarry" is any "hardrock" open cart mining operation. In Peel, there are quarries for Dundas Shale, Queenston Shale and Whirlpool Sandstone (quarries for Amabel Dolomite are abandoned). Details of the geology and type of operation of some individual pits and quarries are on file in the Regional Planning Department, or may be found in publications of the Division of Mines, Ontario Ministry of Natural Resources.

Existing licensed pits and quarries are shown on Map 9. This Map indicates the location of the pit or quarry, and approximate position of sites licensed under The Pits and Quarries Control Act, 1971 for extractive operations. Some of the larger inactive and rehabilitated operations are shown, but there are many small abandoned pits in the interlobate kame-moraines, especially in the eastern half of the former Township of Caledon, which are not shown on the Map. No attempt has been made to show wayside pits and quarries.

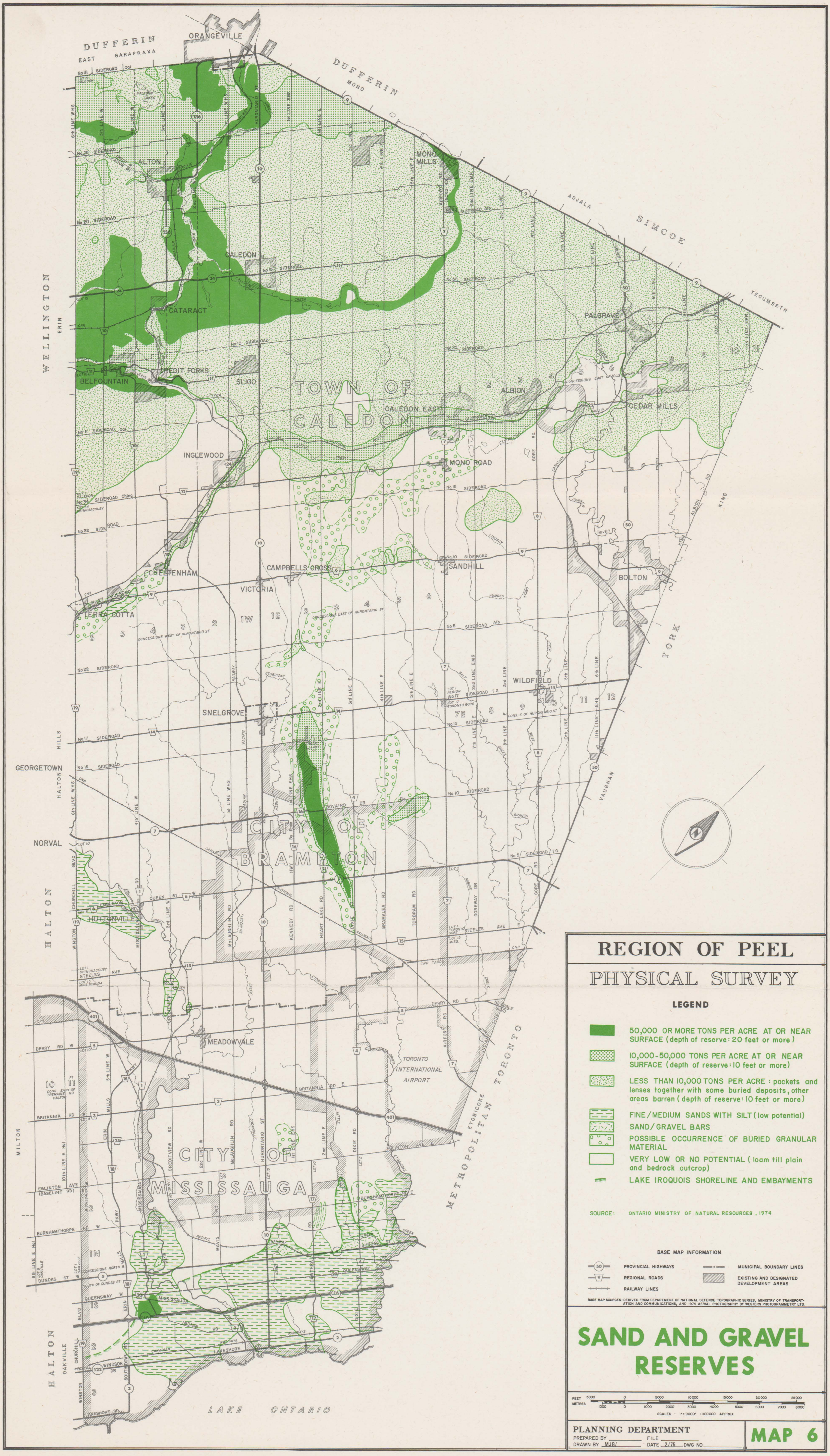
The total value of shale, sandstone and sand and gravel produced in Peel in 1970 was $32,087,265.00 (including cement manufacture), which was over half of the total value ($58,472,092.00) of the whole Metropolitan Toronto Region's 1970 production.

The following production figures for 1972 and 1973 have been supplied by courtesy of Dr. D. F. Hewitt of the Division of Mines, Ontario Ministry of Natural Resources (April, 1975). Where only one or two companies produce from a particular formation or deposit, it is not possible to give production figures.

Table 7

Industrial Mineral Production in the Regional Municipality of Peel 1972 and 1973

		Tons	
1)	Aggregate Tonnages	1972	1973
	a) Sand and Gravel	8,466,038	8,504,512
	b) Dundas Shale	One Producer	One Producer
	c) Queenston Shale	125,248	371,215
	d) Whirlpool Sandstone	One Producer	Two Producers
	e) Amabel Dolomite	No production	No production
2)	Sand and Gravel Tonnages		
	a) Caledon Meltwater Channel	5,894,048	5,523,731
	b) Brampton Esker	2,388,805	2,084,177
	c) Ice-Contact Stratified Drift	One Producer	644,524
	d) Beach and Deltaic	Two Producers	Two Producers
	e) Other (Alluvium)	One Producer	One Producer



REGION OF PEEL

PHYSICAL SURVEY

LEGEND

■	50,000 OR MORE TONS PER ACRE AT OR NEAR SURFACE (depth of reserve: 20 feet or more)
▩	10,000-50,000 TONS PER ACRE AT OR NEAR SURFACE (depth of reserve: 10 feet or more)
▨	LESS THAN 10,000 TONS PER ACRE: pockets and lenses together with some buried deposits, other areas barren (depth of reserve: 10 feet or more)
▤	FINE/MEDIUM SANDS WITH SILT (low potential)
▧	SAND/GRAVEL BARS
○	POSSIBLE OCCURRENCE OF BURIED GRANULAR MATERIAL
□	VERY LOW OR NO POTENTIAL (loam till plain and bedrock outcrop)
┴	LAKE IROQUOIS SHORELINE AND EMBAYMENTS

SOURCE: ONTARIO MINISTRY OF NATURAL RESOURCES, 1974

BASE MAP INFORMATION

50	PROVINCIAL HIGHWAYS	— · —	MUNICIPAL BOUNDARY LINES
9	REGIONAL ROADS	▨	EXISTING AND DESIGNATED DEVELOPMENT AREAS
┼┼┼	RAILWAY LINES		

BASE MAP SOURCES: DERIVED FROM DEPARTMENT OF NATIONAL DEFENCE TOPOGRAPHIC SERIES, MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, AND 1974 AERIAL PHOTOGRAPHY BY WESTERN PHOTOGRAMMETRY LTD.

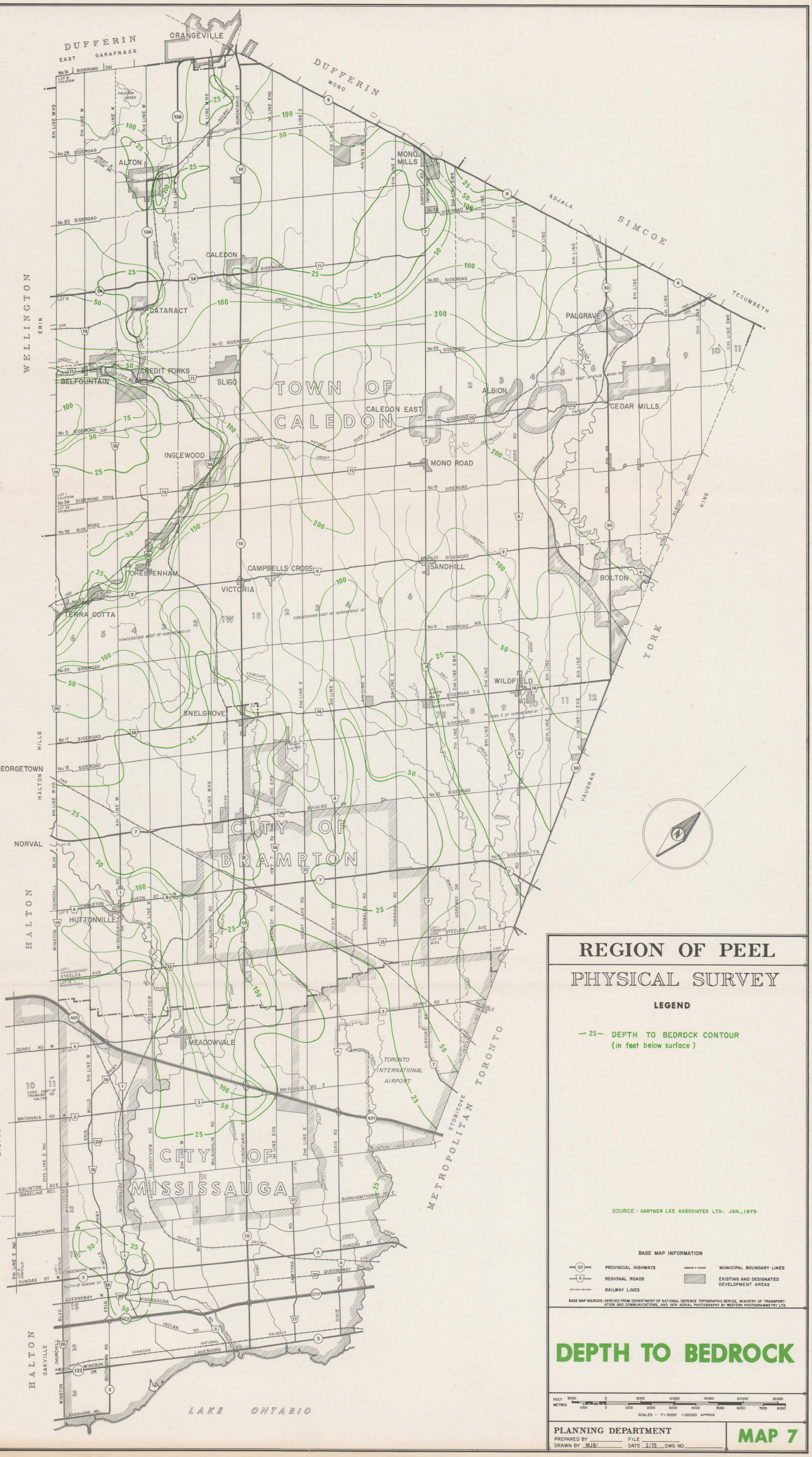
SAND AND GRAVEL RESERVES

FEET 5000 0 5000 10000 15000 20000 25000
METRES 1000 0 1000 2000 3000 4000 5000 6000 7000 8000

SCALES - 1" = 9000' 1:100000 APPROX

PLANNING DEPARTMENT
PREPARED BY ________ FILE ________
DRAWN BY MJB/ ________ DATE 2/75 DWG NO ________

MAP 6



REGION OF PEEL

PHYSICAL SURVEY

LEGEND

—25— DEPTH TO BEDROCK CONTOUR
(in feet below surface)

SOURCE : GARTNER LEE ASSOCIATES LTD. JAN., 1975

BASE MAP INFORMATION

- (50) PROVINCIAL HIGHWAYS
- (9) REGIONAL ROADS
- ┼┼┼ RAILWAY LINES
- ━ • ━ MUNICIPAL BOUNDARY LINES
- ▨ EXISTING AND DESIGNATED DEVELOPMENT AREAS

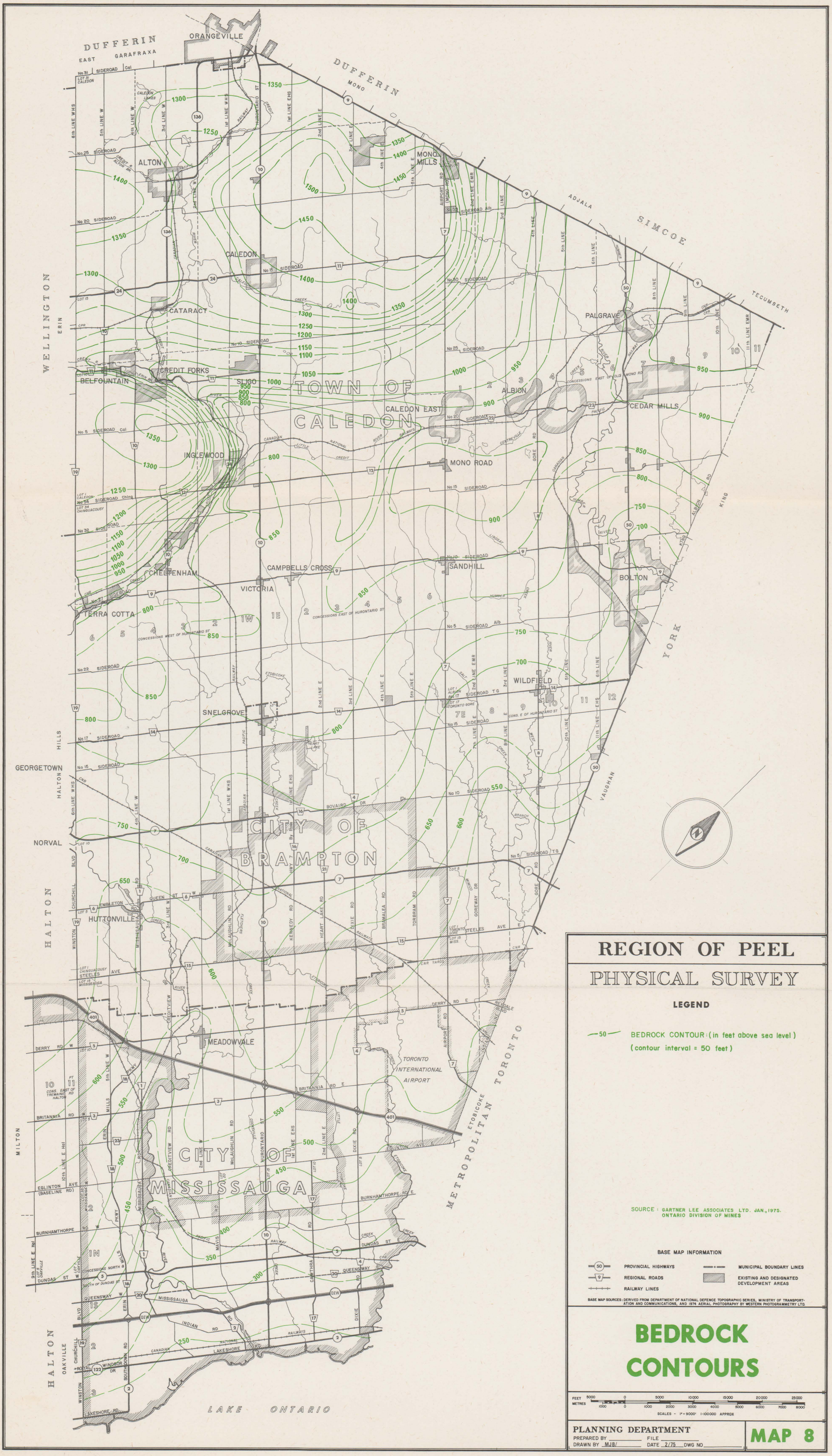
BASE MAP SOURCES: DERIVED FROM DEPARTMENT OF NATIONAL DEFENCE TOPOGRAPHIC SERIES, MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, AND 1974 AERIAL PHOTOGRAPHY BY WESTERN PHOTOGRAMMETRY LTD.

DEPTH TO BEDROCK

FEET 5000 0 5000 10000 15000 20000 25000
METRES 1000 0 1000 2000 3000 4000 5000 6000 7000 8000
SCALES - 1" = 9000' 1:100000 APPROX

PLANNING DEPARTMENT
PREPARED BY ____________ FILE ____________
DRAWN BY MJB/ DATE 2/75 DWG NO ____________

MAP 7



REGION OF PEEL

PHYSICAL SURVEY

LEGEND

—50— BEDROCK CONTOUR: (in feet above sea level)
(contour interval = 50 feet)

SOURCE: GARTNER LEE ASSOCIATES LTD. JAN., 1975.
ONTARIO DIVISION OF MINES

BASE MAP INFORMATION

(50)	PROVINCIAL HIGHWAYS	—·—	MUNICIPAL BOUNDARY LINES
9	REGIONAL ROADS	▨	EXISTING AND DESIGNATED DEVELOPMENT AREAS
+++++	RAILWAY LINES		

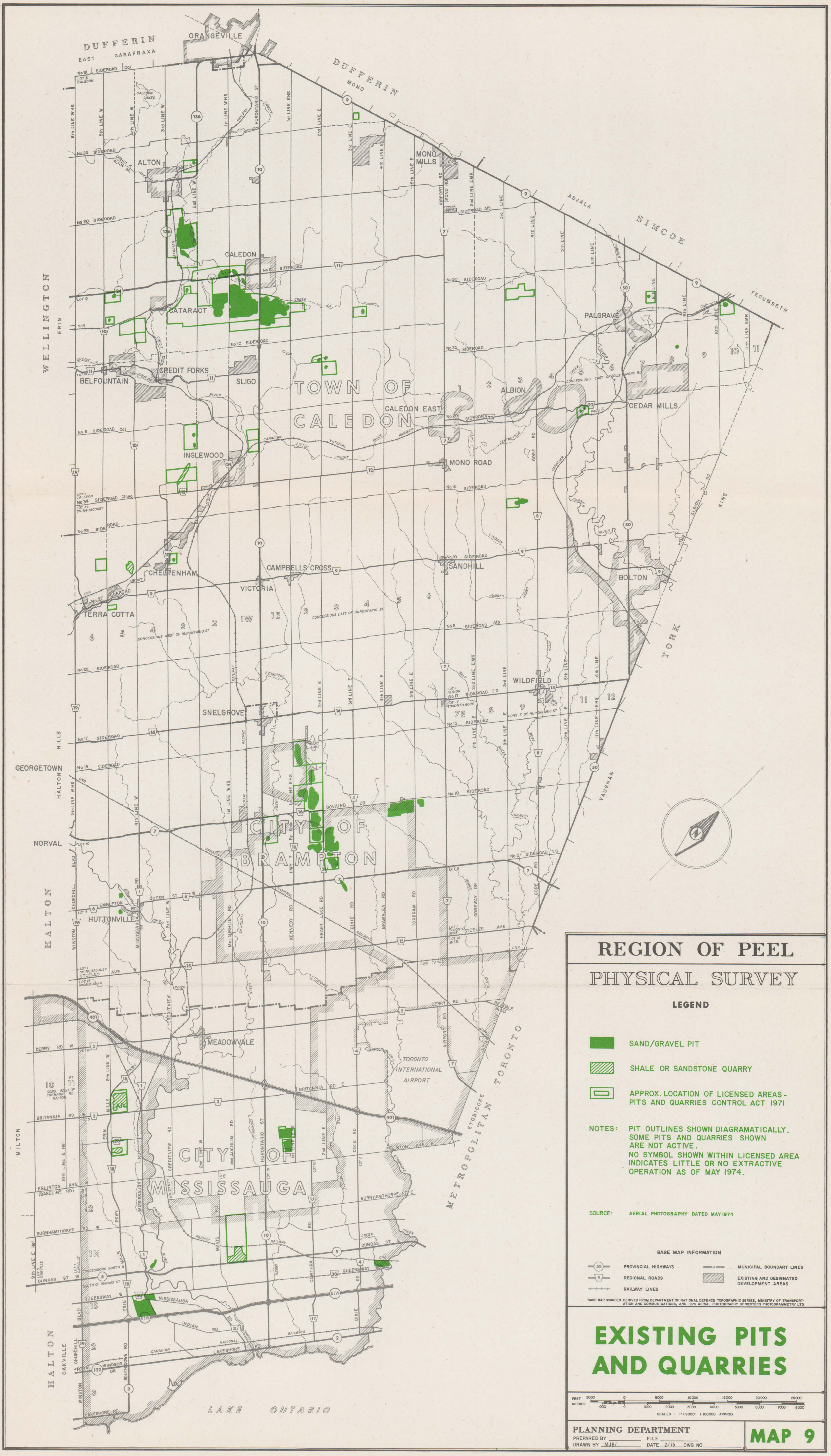
BASE MAP SOURCES: DERIVED FROM DEPARTMENT OF NATIONAL DEFENCE TOPOGRAPHIC SERIES, MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, AND 1974 AERIAL PHOTOGRAPHY BY WESTERN PHOTOGRAMMETRY LTD.

BEDROCK CONTOURS

FEET 5000 0 5000 10000 15000 20000 25000
METRES 1000 0 1000 2000 3000 4000 5000 6000 7000 8000
SCALES - 1" = 9000' 1:100000 APPROX

PLANNING DEPARTMENT
PREPARED BY
FILE
DRAWN BY MJB/
DATE 2/75
DWG NO

MAP 8



REGION OF PEEL

PHYSICAL SURVEY

LEGEND

🟩	SAND/GRAVEL PIT
▨	SHALE OR SANDSTONE QUARRY
▭	APPROX. LOCATION OF LICENSED AREAS - PITS AND QUARRIES CONTROL ACT 1971

NOTES: PIT OUTLINES SHOWN DIAGRAMATICALLY.
SOME PITS AND QUARRIES SHOWN ARE NOT ACTIVE.
NO SYMBOL SHOWN WITHIN LICENSED AREA INDICATES LITTLE OR NO EXTRACTIVE OPERATION AS OF MAY 1974.

SOURCE: AERIAL PHOTOGRAPHY DATED MAY 1974

BASE MAP INFORMATION

50	PROVINCIAL HIGHWAYS	—•—	MUNICIPAL BOUNDARY LINES
9	REGIONAL ROADS	▨	EXISTING AND DESIGNATED DEVELOPMENT AREAS
┼┼┼	RAILWAY LINES		

BASE MAP SOURCES: DERIVED FROM DEPARTMENT OF NATIONAL DEFENCE TOPOGRAPHIC SERIES, MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, AND 1974 AERIAL PHOTOGRAPHY BY WESTERN PHOTOGRAMMETRY LTD.

EXISTING PITS AND QUARRIES

FEET 5000 0 5000 10000 15000 20000 25000
METRES 1000 0 1000 2000 3000 4000 5000 6000 7000 8000
SCALES - 1" = 9000' 1:100000 APPROX

PLANNING DEPARTMENT
PREPARED BY ______ FILE ______
DRAWN BY MJB/ DATE 2/75 DWG NO ______

MAP 9

CHAPTER VIII

SURFACE DRAINAGE

Characteristics of Watersheds

In the Region of Peel, there are four watersheds (three major and one minor) draining the total area of 488 square miles. They are the Credit River Watershed, the Humber River Watershed, the Etobicoke Creek Watershed and the Cooksville Creek Watershed (refer to Map 10). Lake Ontario, the receiving waterbody for these drainage basins, forms the southeastern boundary of the Region and provides approximately nine miles of shoreline (all in the City of Mississauga).

Lake Ontario and the rivers and creeks play an important role in the economic growth and development of the Region, since they provide water for industrial, domestic, agricultural and recreational uses. The estimated quantity of water currently used for domestic purposes by residents of the two southern municipalites in Peel is about 115 million gallons per day. Of this, about 84 million gallons per day are consumed in the City of Mississauga, and 31 million gallons per day in the City of Brampton. In addition, a greater quantity of untreated water (approximately 500 million gallons per day) is drawn from Lake Ontario for industrial uses. Of this, more than two-thirds is used for cooling purposes by Ontario Hydro's Lakeview Generating Station. Untreated water from the streams in the four Watersheds is used to some extent for irrigation of farmlands, horticultural nurseries and golf courses. The stream valleys provide open space for recreational uses.

As a consequence of urban development, the natural drainage patterns of the Region of Peel have been altered. The covering and paving of rural land has increased the rate and amount of surface run-off, particularly during periods of heavy rainfall in the spring and summer. Urban development has encroached upon the floodplains, thereby reducing the natural storage capacities of the stream valleys. All of these conditions, together with other factors such as steep gradients, the absence of natural storage basins along the main streams, and occasional warm spring temperatures and heavy rainfall, cause flows in excess of channel capacities, resulting in spring floods in all of the watersheds. Summer floods can also occur as a result of heavy precipitation in thunderstorms. The areas most vulnerable to seasonal flooding in the Region of Peel are shown on Map 10.

Some of the characteristics of the three major watersheds are as follows.

Credit River Watershed

The Credit River drains portions of the Town of Caledon and of the Cities of Brampton and Mississauga, covering a total area in Peel of about 190 square miles. This area represents approximately 56% of the Credit River Watershed.

The Credit River system in Peel has seven main branches: the main Credit, the West Branch, Silver Creek, Shaw's Creek, Caledon Creek, the East Credit and Fletcher's Creek. The Credit River has two source areas: one in the Oak Ridges Moraine Complex near Orangeville, and the other in the area west of Caledon Lake.

The Credit River system generally flows south-easterly in an irregular course, and enters Lake Ontario at Port Credit, with a drop in elevation of 1,185 feet from the headwaters to Lake Ontario. The gradient of the main Credit averages 21.4 feet per mile. The gradient of the upper reach of the River averages 27 feet per mile; the middle reach, 16 feet per mile; and the lower reach, 23 feet per mile. The greatest fall occurs from Cataract to the Forks of the Credit, where the drop in elevation is about 96 feet per mile.

There are two gauging stations in the Credit River Watershed:

one at Erindale and one at Cataract.

Humber River Watershed

The Humber River drains an area of 344 square miles. It has four main branches: the main Humber, the East Branch, the West Branch and Black Creek. The sources of the main River and the East Branch are in the Oak Ridges Moraine Complex (in an area east of Orangeville). The main River drops 1,200 feet in the 58 miles of its course, with the greatest fall occurring in the first 8 miles.

From Bolton to Lake Ontario, the Humber River is characterized by meandering, deep valleys and steeply sloping banks.

Frequent seasonal flooding is experienced along the Humber in the Bolton area.

The West Branch of the Humber drains an area which consists predominantly of Peel plain. It falls 560 feet in the 23 miles of its length.

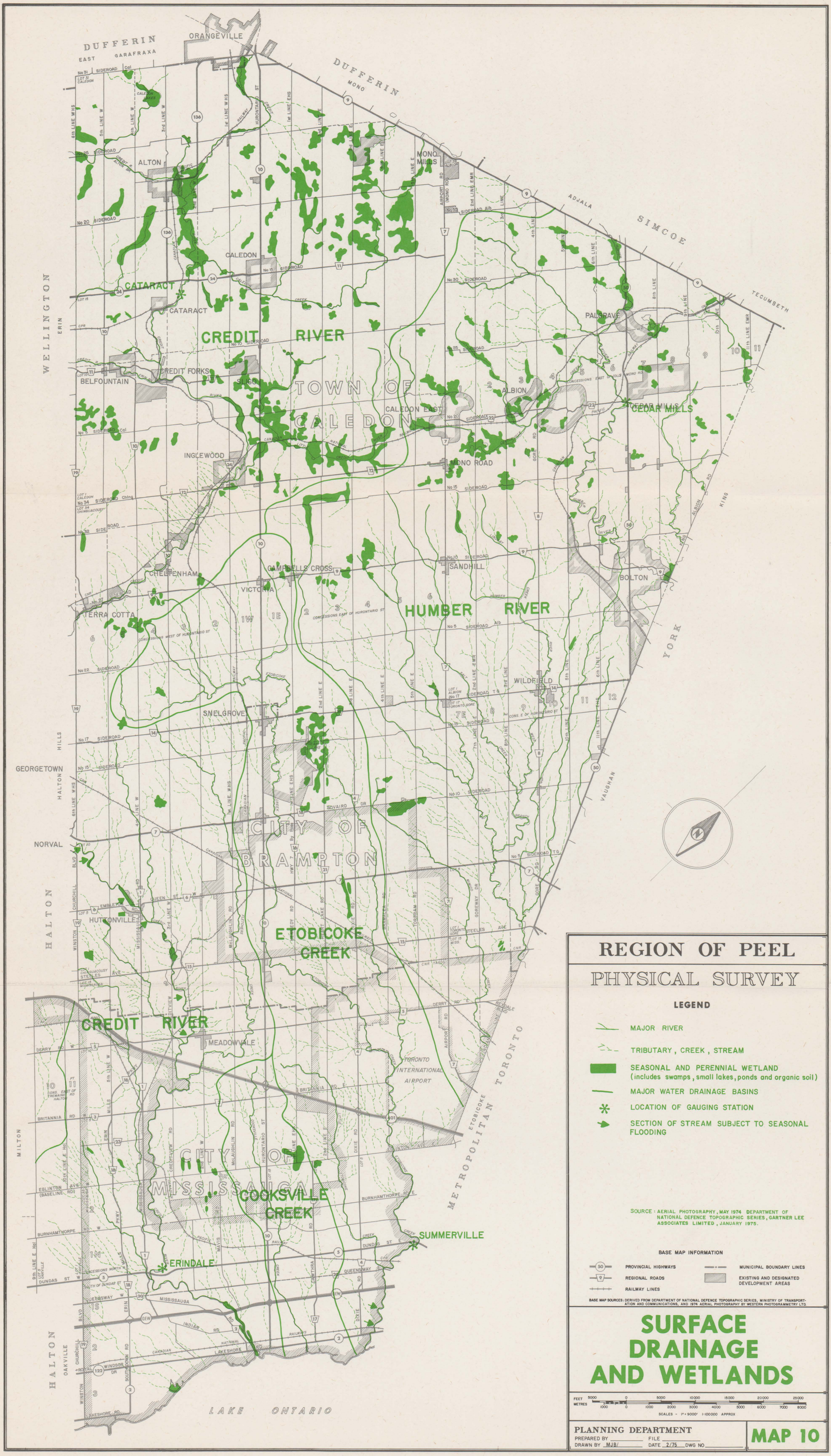
There are two gauging stations on the Humber River system as shown on Map 10.

Etobicoke Creek Watershed

The Etobicoke Creek drains an area of 79 square miles. The source lies on the eastern slope of a low gravel ridge which divides the drainage basins of the Etobicoke Creek and the Credit River. The Creek has three main branches: the main Etobicoke Creek, the West Branch and the East Branch.

The West Branch, with its source in the gravel ridge, flows through the hamlet of Snelgrove and the former Town of Brampton. The East Branch, with its source near the hamlet of Mayfield, draws much of its water from springs, which are fed by seepage from a sand and gravel ridge lying northeast of the former Town of Brampton (Brampton Esker).

The drops in elevation of the West Branch and the East Branch to the junction of these two Branches are 24.2 and 31 feet per mile respectively. The main Etobicoke Creek drops more sharply from south of Dundas Street to Lake Ontario at about 33 feet per mile.



REGION OF PEEL

PHYSICAL SURVEY

LEGEND

	MAJOR RIVER
	TRIBUTARY, CREEK, STREAM
🟩	SEASONAL AND PERENNIAL WETLAND (includes swamps, small lakes, ponds and organic soil)
	MAJOR WATER DRAINAGE BASINS
*	LOCATION OF GAUGING STATION
➜	SECTION OF STREAM SUBJECT TO SEASONAL FLOODING

SOURCE: AERIAL PHOTOGRAPHY, MAY 1974 DEPARTMENT OF NATIONAL DEFENCE TOPOGRAPHIC SERIES, GARTNER LEE ASSOCIATES LIMITED, JANUARY 1975.

BASE MAP INFORMATION

(50)	PROVINCIAL HIGHWAYS		MUNICIPAL BOUNDARY LINES
(9)	REGIONAL ROADS	▨	EXISTING AND DESIGNATED DEVELOPMENT AREAS
	RAILWAY LINES		

BASE MAP SOURCES: DERIVED FROM DEPARTMENT OF NATIONAL DEFENCE TOPOGRAPHIC SERIES, MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, AND 1974 AERIAL PHOTOGRAPHY BY WESTERN PHOTOGRAMMETRY LTD.

SURFACE DRAINAGE AND WETLANDS

FEET 5000 0 5000 10000 15000 20000 25000
METRES 1000 0 1000 2000 3000 4000 5000 6000 7000 8000
SCALES - 1" = 9000' 1:100000 APPROX

PLANNING DEPARTMENT
PREPARED BY ________ FILE ________
DRAWN BY MJB/ DATE 2/75 DWG NO ________

MAP 10

CHAPTER IX

GROUNDWATER

Groundwater is the water that occurs in the saturated portions of soil, overburden and bedrock. It is part of the hydrologic cycle and is a renewable resource.

The water lost by evaporation, transpiration and by artificial means, such as extraction by wells, is replenished by the infiltration of precipitation and water from streams.

Groundwater is present in pore spaces in the overburden, and in joints, cracks, fissures, bedding plains and pore spaces in the bedrock. As water infiltrates from the land surface through these materials, it passes through an unsaturated zone to a water-table below which the overburden and the rock formations are saturated with water. The level of the water-table varies, depending upon the time of the year. It is generally highest during April and May after the spring thaw, and lowest during the fall, because very little recharge occurs during the summer months.

Clay, silt and fine sand will hold more water than coarse sand or gravel because they are more finely grained, and are less pervious than coarse sand or gravel. Similarly, shale is less pervious than well-jointed limestone or dolomite. The pervious rocks and overburden that readily permit the movement of groundwater are referred to as aquifers; whereas, the relatively impervious materials are called aquicludes. Aquicludes restrict the movement of groundwater and may act as confining layers above or below aquifers. Where water is confined in an aquifer below an aquiclude, it is under pressure, and if a well were to be drilled into it, the water would rise to a higher level than the top of the aquifer. Such an aquifer is termed artesian, and the well drilled into it, an artesian well. The potentiometric surface of a confined aquifer is thus higher than the water-table. Where the aquifer is unconfined and the water is not under pressure, the water level in a well will be the same as the level of the water-table in the aquifer outside the well.

In Peel, the major aquifers are the dolomite above the Niagara Escarpment, the deep sands and gravels of the meltwater channels and, to a lesser extent, the kame-moraine deposits of the glacial overburden. South and east of the Niagara Escarpment, the bedrock is mostly shale, which is classed as an aquiclude, although water does occur in thin limestone layers and in weathered parts within ten or fifteen feet of the bedrock's surface. In the southern Peel plain, till and thin glacial drift result in the essential absence of important overburden aquifers (an exception being the Brampton Esker).

Groundwater Availability

Groundwater in both the overburden and bedrock depends for its replenishment on rain and snowfall. Annual precipitation in the Region of Peel ranges from about 28 inches in the extreme south to 32 inches in the extreme northwest. This is distributed more or less evenly, with each month of the year receiving 2" - 3". The summer months generally see more short heavy rain in the form of thunderstorms with rapid run-off. Evapotranspiration is also greater during the summer, and these two factors prevent significant groundwater recharge during the summer months. Most of the effective recharge takes place from October to May, with peak recharge conditions occurring during the spring thaw. The precipitation during this period amounts to about 17 inches, but it is doubtful if more than 40 percent of this (about 7 inches) recharges the aquifers. This is equivalent to a perennial groundwater supply of 264,000 gallons per day for every square mile of land. This does not necessarily mean that there is an available resource of

264,000 gallons per day per square mile from the groundwater in Peel. The complex distribution and character of the aquifers determine the supply of groundwater or probable well yields. Large supplies of groundwater (excluding private domestic and farm supplies) are limited to areas above the Escarpment, or where there is an overburden aquifer below the Escarpment. Large areas of central and southern Peel have no significant overburden aquifers, and the underlying bedrock is a shale aquiclude.

Groundwater Configuration

Map 11 illustrates the general contour pattern of the piezometric surface and regional groundwater flow directions. The piezometric surface or potential head is the theoretical level to which water should rise under its own pressure if tapped by a well or spring. On a regional basis, the piezometric surface may approximate the water-table, but in certain areas where there are confined aquifers (aquifers underlying aquicludes), the piezometric surface may be higher than the water-table. Sands beneath till may constitute a confined aquifer, and wells tapping such an aquifer may be sub-artesian or artesian, as is the case with certain wells in the Peel plain.

In some places, there may be a perched water-table, notably where an unconfined sand aquifer overlies clay or clay till.

The regional flow of groundwater in Peel is to the south-east, towards Lake Ontario. Locally, groundwater flow is downhill and outwards towards discharge areas such as stream and river valleys.

Groundwater Recharge Areas and Aquifers

Above the Niagara Escarpment, the dolomite bedrock forms an important aquifer. In places, such as near the brow of the Escarpment south of Credit Forks, and in certain areas south of

Alton and Mono Mills, it outcrops to the surface or underlies a shallow covering of glacial drift. These areas may be considered as important bedrock aquifer recharge areas. Overlying the dolomite aquifer in northwestern Peel are glacial drift deposits of varying thicknesses. Depending upon their composition, thickness and, to a lesser extent, topography, the glacial drift deposits form aquifers and recharge areas. Map 12 shows a broad categorization of recharge areas and aquifers in the Region of Peel.

Important aquifers are the unconfined deep sands and gravels of the ancient meltwater channels south of Orangeville and west of the former Village of Caledon. The hilly areas of sandy kame-moraine and outwash deposits (ice-contact stratified drift) of the Orangeville Moraine and the Oak Ridges Moraine Complex are significant groundwater recharge areas. The variable composition of these units results in variable porosities and local groundwater characteristics. These recharge areas provide water both to the overburden aquifers and to the bedrock aquifer (notably where the overburden is thin).

South and east of the Escarpment, the bedrock consists of the Queenston and Meaford-Dundas shales, which have low porosities and act as aquicludes. All aquifers east of the Escarpment are in the overburden. The northern and northeastern part of the Region (Oak Ridges Moraine Complex) is an important groundwater recharge area as mentioned above. Along the southern margin of this area, from the former Township of Albion through Caledon East to Inglewood, a glacial meltwater channel provides a good unconfined deep sand aquifer. It is possible that this continues beneath the present Credit River Valley through Inglewood to the Peel border at Terra Cotta.

The till plains (both the Halton-Peel till plain and the till plain northwest of the Escarpment) are generally classed as poor recharge areas, although certain sandy areas provide good recharge conditions locally. The Brampton Esker, for example, acts as a groundwater recharge "window" and aquifer in the till plain. A local groundwater mound and a number of kettle ponds occur in the Esker, and in fact, this groundwater mound is the source for several small streams.

The recharge areas of upland northern Peel feed groundwater into and beneath the lower elevation of the Peel till plain and ultimately to the Humber and Credit Rivers (and their tributaries). Sands beneath and within the Halton Till of the Peel plain thus form confined or partly confined aquifers, and wells are sometimes artesian.

In the extreme south of Peel, beach bars and shallow sands associated with glacial Lake Iroquois form relatively minor aquifers. Apart from the beach bars, the aquifers are generally very thin and unimportant.

Groundwater Discharge Areas

Stream and river valleys are discharge areas, as are lakes, ponds, springs and wetland source areas (although sometimes these waterbodies may serve to recharge if the water-table drops, such as during prolonged dry weather).

The important discharge areas in the Region of Peel are the face and foothill lands of the Niagara Escarpment (some springs discharge up to 3,000 gallons per hour from the base of the Amabel dolomite aquifer where it rests on the Cabot Head shale aquiclude), and the steep valleys of the Humber and Credit Rivers (and their larger tributaries) where they cut the upland recharge areas as between Cataract and south of Credit Forks.

Groundwater Quality

Groundwater in Peel is generally hard, but suitable for most domestic and agricultural purposes. Water from certain sections of the overburden has an iron content that exceeds the recommended maximum of 0.3 p.p.m. for municipal supplies. In some places on the Peel plain, the shale bedrock yields salty water (from wells which have penetrated the top 10 to 15 feet of shale bedrock).

Groundwater Supply

Map 13 gives a classification of groundwater availability based on well yields. The information is derived from a map, prepared by the Ontario Ministry of the Environment, showing probable well yields for the Central Ontario Lakeshore Urban Complex (C.O.L.U.C.). It is generalized and does not distinguish between bedrock and overburden water availability. For a general indication of the relationship between yield rates and adequacy for various purposes, see Table 8 at the end of this Chapter.

Water Supply from Bedrock

Shales

Most of southern, central and eastern Peel is underlain by shales (Meaford-Dundas and Queenston Formations), which are classed as aquicludes, and in which wells can generally be expected to yield little or no water because of low porosities. What water can be obtained is often likely to be saline and unsuited for domestic use. Some domestic wells in the Region do obtain water from the shales, but this is usually from the top 20 feet or so of weathered, more "open structured" shale. A little water may also be obtained from zones with more permeable sandy and calcareous layers within the shales. Well yields from the shales can generally be expected to be less than 10 gallons per minute.

The Cabot Head shale, which underlies the Amabel dolomite in the northwest of the Region (outcropping in the Escarpment), may also be classed as an aquiclude.

Sandstone Aquifer

The Whirlpool Sandstone, although only 12-15 feet thick, may be expected to act as a good aquifer. It is doubtful, however, if any water wells tap this formation, since it is quite deeply buried where it occurs north and west of the Escarpment.

Dolomite Aquifer

In northwest Peel, above the Niagara Escarpment, the Amabel dolomite can be expected to yield 45 - 450 gallons per minute of good quality water. Natural springs from the base of the dolomite along the face of the Escarpment produce up to 50 gallons of water per minute. The dolomite aquifer may be more than 100 feet thick in places.

The Manitoulin Formation is another unit of dolomite and magnesian limestone with a few interbeds of shale. It is not known whether any wells penetrate the Manitoulin limestone, and there is little information about its water-bearing properties. It may be expected to act as a partial aquifer, with less potential than the Amabel dolomite aquifer. The formation is about 25 feet thick.

Water Supply from Overburden

To predict well yields from the overburden is difficult because of the extremely variable lithology and thicknesses of the glacial deposits. Pods and lenses of high water-yielding sands and gravels interdigitate with silts and clays. This is notably the case in the Oak Ridges Moraine Complex and other moraines above the Escarpment, where well yields are often highly variable over short distances (e.g., 10 feet). Certain generalizations can be made, however, as a rough guide to the hydrogeology and groundwater availability of the overburden.

Much of the Peel plain can be expected to produce very low yields from wells. Small supplies of groundwater may be obtained from storage in large diameter wells, but generally the yield expected is less than 2.5 gallons per minute. The clays and silts of the Halton-Peel till essentially form an aquiclude. In certain places, however, lenses of sand occur within, or on top of the till and provide local aquifers. Examples are the Brampton Esker, the sand area around Huttonville in the Credit River Valley and the Lake Iroquois beach bars in Mississauga. At one time, the eight municipal wells in the Brampton Esker each yielded 250 - 600 gallons of water per minute.

The northern Peel meltwater channel aquifers (Albion to Inglewood, Caledon to Erin, the upper Credit River Valley) can be expected to yield copious quantities of water (approximately 250 gallons per minute). However, the thickness of the meltwater channel gravels and sands relative to the depth of the water-table, and "islands" or lenses of silt or clay, make even these aquifers variable as sources of water.

Northwest of the Escarpment, hilly areas of the Orangeville Moraine may be expected to give variable well yields.

Clay loam till plains can be expected to have poor water yields.

There is some evidence from deep municipal wells in Bolton and Palgrave of deep buried sand aquifers within the pre-glacial Humber River Valley. High yields are obtained from closely-spaced wells in such an aquifer at Bolton (350 - 500 gallons per minute). Similar high-yield aquifers may occur elsewhere in deep pre-glacial valleys filled with glacial and fluvioglacial deposits.

Present Water Supply in the Region of Peel

South of No. 17 Sideroad, most water needs for domestic, stock and industrial uses are met by piped services from Lake Ontario. Only about 2% of domestic and stock supplies still come from private groundwater wells, and this percentage is expected to decrease in the future. The present Lakeview Water Treatment Plant (on Lake Ontario) has a capacity of 78 million gallons of water per day, with present consumption around 32 million gallons per day (although this has peaked at 63 million gallons per day). A second treatment plant with similar capacity is currently being planned for construction in Clarkson.

North of No. 17 Sideroad, all water supply is derived from groundwater. Municipal wells (sometimes via small reservoirs or storage tanks) together with some private wells supply the communities of Bolton, Palgrave, Caledon East, Caledon and Mono Mills. Elsewhere, water is obtained entirely from private wells.

Bolton's municipal water is derived from a Pleistocene sand aquifer 15 - 20 feet thick and 340 feet below surface in the Humber River Valley. There are three producing wells a few hundred feet apart in this aquifer, with one well yielding 350 - 500 gallons of water per minute.

Palgrave has one existing municipal well yielding about 100 - 150 gallons per minute. A new well is going in to about the 40 foot depth. A well for the Cedar Mills subdivision produces 150 - 200 gallons per minute from a local sand aquifer in the Oak Ridges Moraine.

At Caledon East, there are two active wells producing from the Caledon East meltwater channel (unconfined aquifer).

The former Village of Caledon has one municipal well producing about 35 gallons per minute supplying a small reservoir (50,000 gallon capacity). Private wells supplement the municipal water supply.

At Mono Mills, one municipal well yields about 100 gallons of water per minute, and a new well is expected to yield about 150 gallons per minute from a sand and gravel aquifer, at about a 40 foot depth. The present well suffers from high nitrate pollution. Other water sources are private domestic wells.

At Cataract, an abandoned well, with a depth of about 100 feet, yielded only 4 - 5 gallons of water per minute, presumably because it was wrongly placed with respect to the local aquifer.

The present water supply is from private wells.

In the hamlet of Albion, a new municipal well is being drilled and is expected to yield about 150 gallons per minute.

Inglewood, Cheltenham, Terra Cotta, Alton, Snelgrove, Belfountain, Wildfield, Victoria and all other communities and farms are sustained by private water wells. In the Inglewood area, it is considered feasible for three or four wells to be drilled, 50 feet apart, each to a depth of 10 feet, and each to yield 30 gallons of water per minute.

Generally speaking, overburden and/or bedrock groundwater in northern Peel is adequate for domestic, stock/agricultural and local municipal purposes. Certain parts of the Peel plain have inadequate supplies for other than domestic use, but this is unimportant south of No. 17 Sideroad, where piped services exist or can be made available to supply water from Lake Ontario. In summer, and especially during periods of dry weather, the water-table and the piezometric surface are lower, and certain wells may be depleted or may run dry.

Detailed analysis of existing well data will be necessary to refine this generalized picture of groundwater availability in the Region of Peel.

Groundwater Pollution

The areas most sensitive to groundwater pollution are generally the unconfined aquifers and recharge areas; that is, those areas where permeable surface conditions exist. If an aquifer occurs beneath a "non-aquifer", pollution susceptibility of the aquifer is proportional to the permeability and thickness of the overlying material.

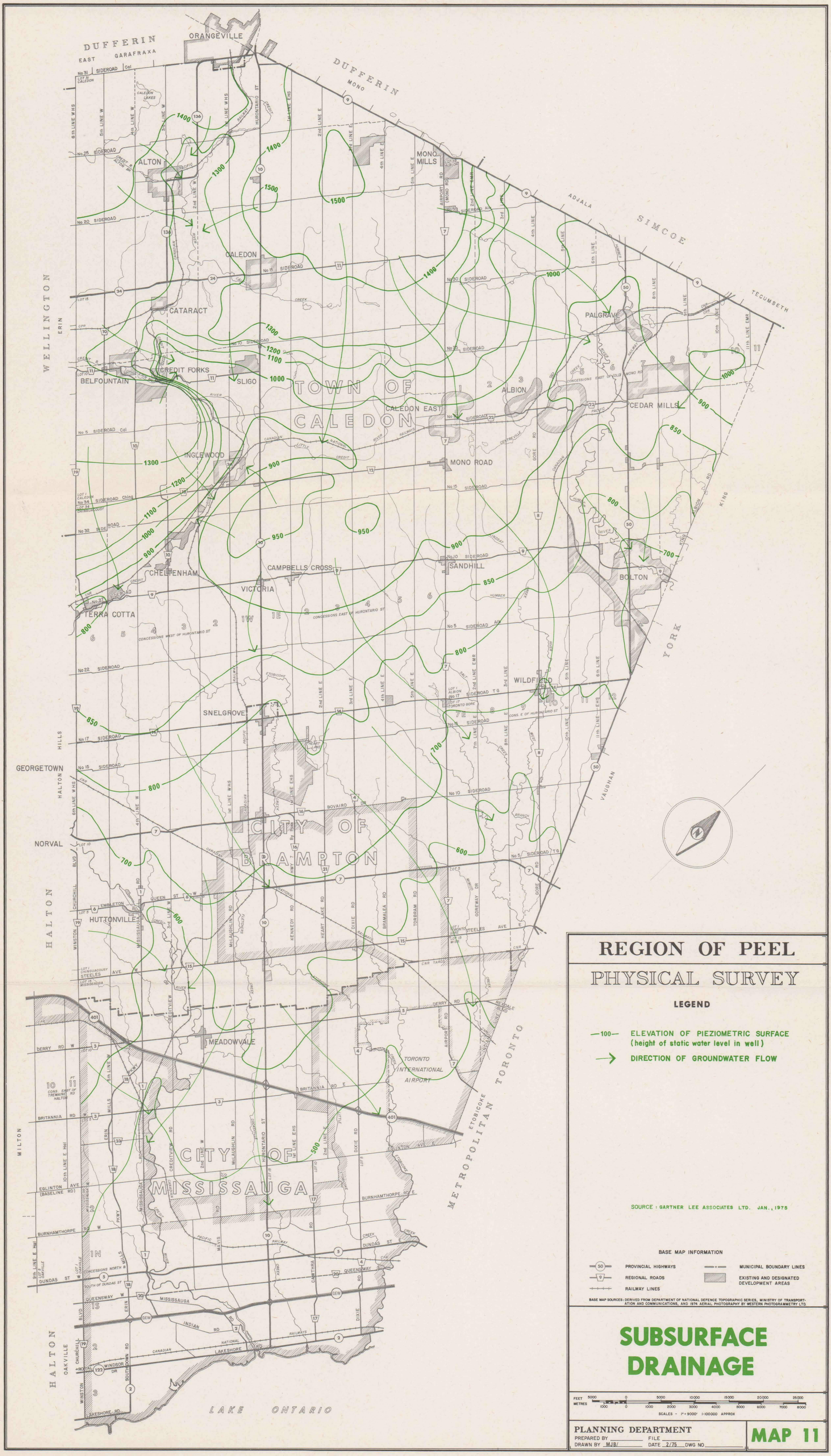
The pollution susceptibility of the groundwater supply depends on the position of the aquifer(s) in relation to both the source of pollution and the local hydrogeologic conditions.

Map 14 shows broad categories of susceptibility of the groundwater to pollution in the Region of Peel.

Table 8

Well Yield Rates and Adequacy for Various Purposes

Gallons per minute yield from well	Purposes
less than 2 g.p.m.	Inadequate to marginal for most domestic or other purposes.
2 g.p.m. - 10 g.p.m.	Marginal to adequate for domestic or stock purposes.
10 g.p.m. - 50 g.p.m.	Adequate for most farming, small industrial and commercial purposes.
greater than 50 g.p.m.	Adequate for most irrigation and many industrial and municipal purposes.



REGION OF PEEL

PHYSICAL SURVEY

LEGEND

—100— ELEVATION OF PIEZIOMETRIC SURFACE (height of static water level in well)

→ DIRECTION OF GROUNDWATER FLOW

SOURCE : GARTNER LEE ASSOCIATES LTD. JAN., 1975

BASE MAP INFORMATION

(50)	PROVINCIAL HIGHWAYS	—•—	MUNICIPAL BOUNDARY LINES
9	REGIONAL ROADS	▨	EXISTING AND DESIGNATED DEVELOPMENT AREAS
┼┼┼	RAILWAY LINES		

BASE MAP SOURCES: DERIVED FROM DEPARTMENT OF NATIONAL DEFENCE TOPOGRAPHIC SERIES, MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, AND 1974 AERIAL PHOTOGRAPHY BY WESTERN PHOTOGRAMMETRY LTD.

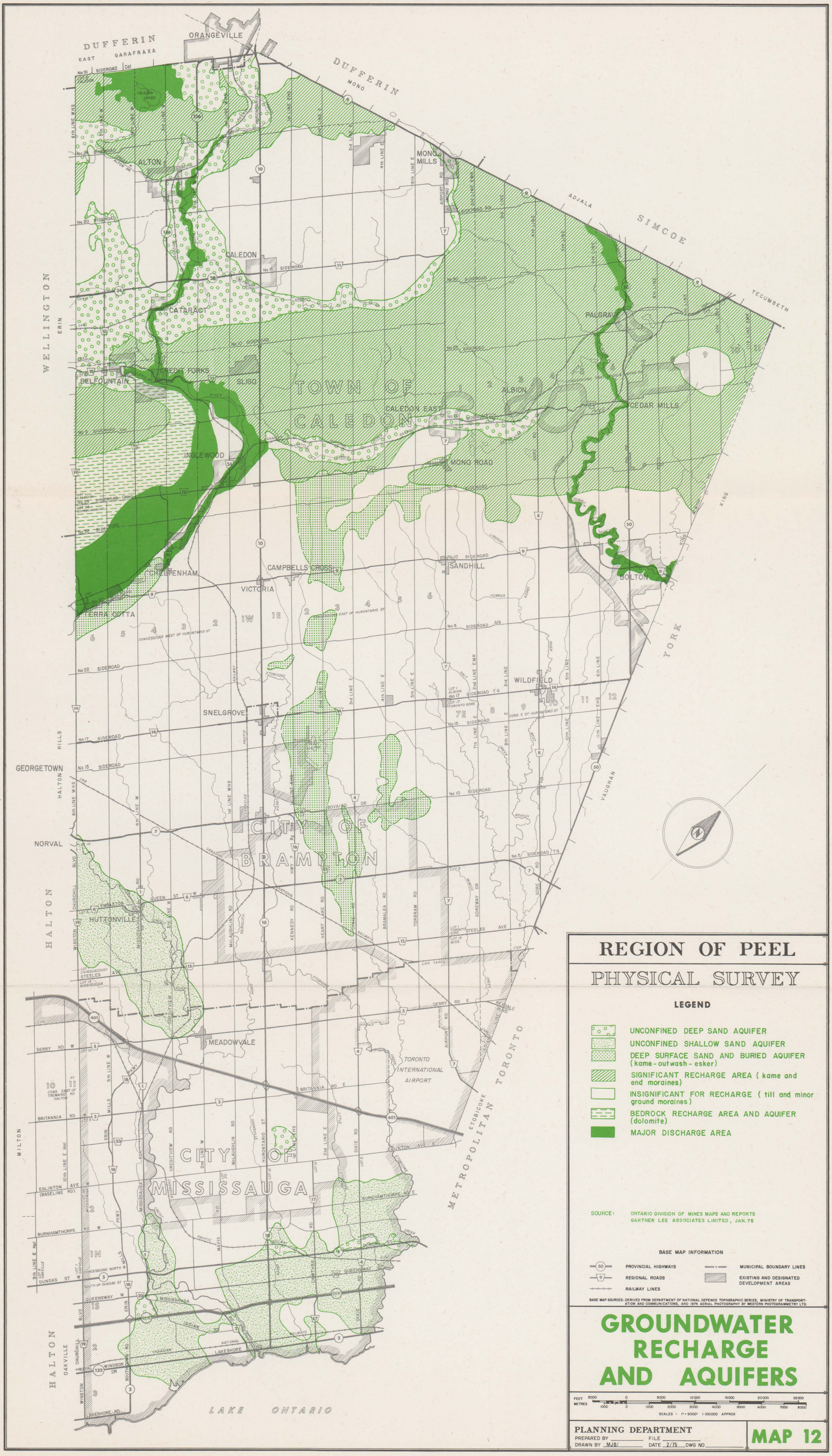
SUBSURFACE DRAINAGE

FEET 5000 0 5000 10000 15000 20000 25000
METRES 1000 0 1000 2000 3000 4000 5000 6000 7000 8000
SCALES - 1" = 9000' 1:100000 APPROX

PLANNING DEPARTMENT

PREPARED BY ____ FILE ____
DRAWN BY MJB/ DATE 2/75 DWG NO ____

MAP 11



REGION OF PEEL

PHYSICAL SURVEY

LEGEND

- ⁘ UNCONFINED DEEP SAND AQUIFER
- ░ UNCONFINED SHALLOW SAND AQUIFER
- ▒ DEEP SURFACE SAND AND BURIED AQUIFER (kame - outwash - esker)
- ▨ SIGNIFICANT RECHARGE AREA (kame and end moraines)
- ☐ INSIGNIFICANT FOR RECHARGE (till and minor ground moraines)
- ☰ BEDROCK RECHARGE AREA AND AQUIFER (dolomite)
- ■ MAJOR DISCHARGE AREA

SOURCE: ONTARIO DIVISION OF MINES MAPS AND REPORTS
GARTNER LEE ASSOCIATES LIMITED, JAN. 75

BASE MAP INFORMATION

- 50 PROVINCIAL HIGHWAYS
- 9 REGIONAL ROADS
- ┼ RAILWAY LINES
- ─ · ─ MUNICIPAL BOUNDARY LINES
- ▨ EXISTING AND DESIGNATED DEVELOPMENT AREAS

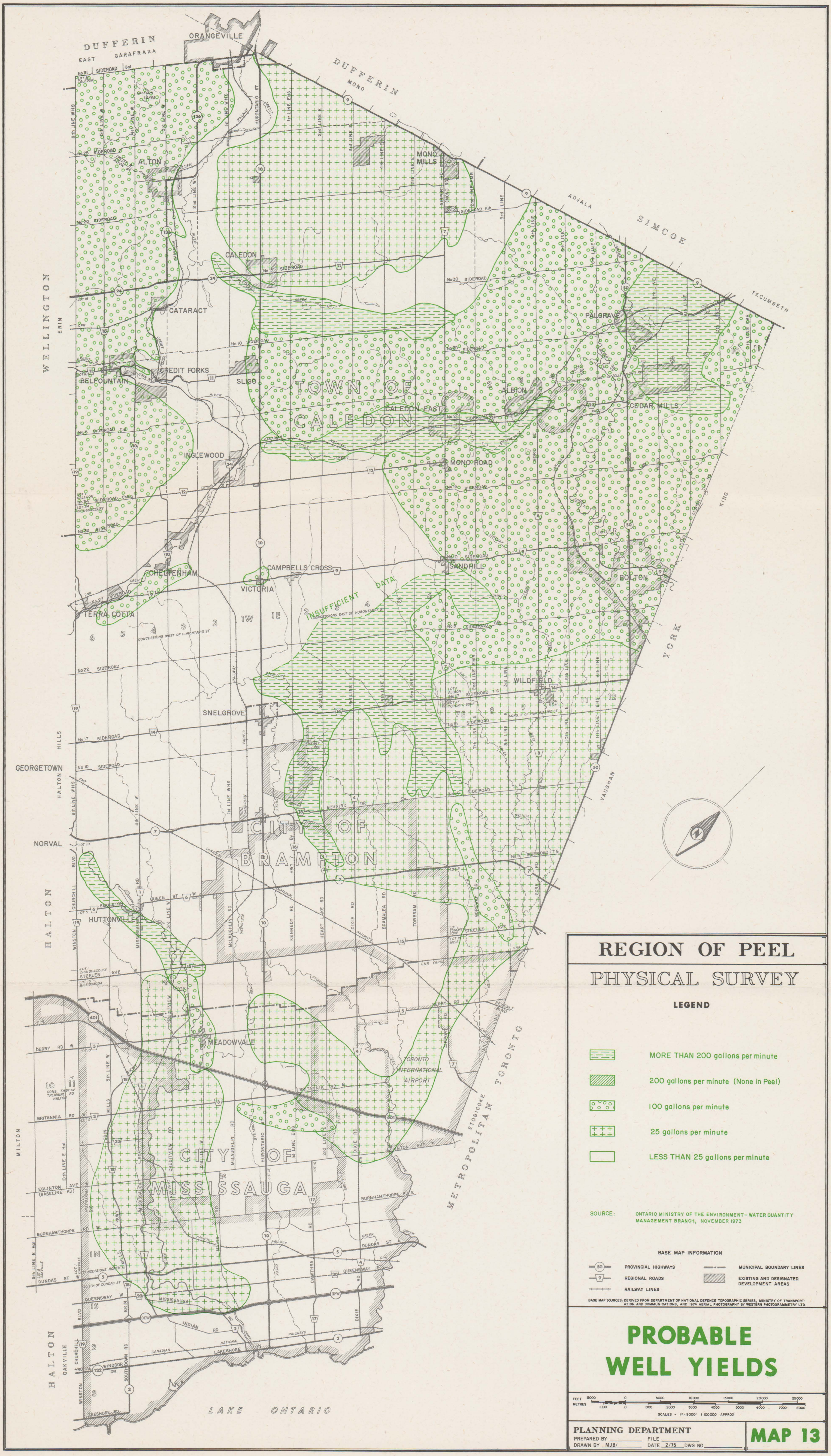
BASE MAP SOURCES: DERIVED FROM DEPARTMENT OF NATIONAL DEFENCE TOPOGRAPHIC SERIES, MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, AND 1974 AERIAL PHOTOGRAPHY BY WESTERN PHOTOGRAMMETRY LTD.

GROUNDWATER RECHARGE AND AQUIFERS

FEET 5000 0 5000 10000 15000 20000 25000
METRES 1000 0 1000 2000 3000 4000 5000 6000 7000 8000
SCALES - 1" = 9000' 1:100000 APPROX

PLANNING DEPARTMENT
PREPARED BY ________ FILE ________
DRAWN BY MJB/ DATE 2/75 DWG NO ________

MAP 12



REGION OF PEEL

PHYSICAL SURVEY

LEGEND

▤	MORE THAN 200 gallons per minute
▨	200 gallons per minute (None in Peel)
⚬	100 gallons per minute
⊞	25 gallons per minute
☐	LESS THAN 25 gallons per minute

SOURCE: ONTARIO MINISTRY OF THE ENVIRONMENT – WATER QUANTITY MANAGEMENT BRANCH, NOVEMBER 1973

BASE MAP INFORMATION

50	PROVINCIAL HIGHWAYS	–·–	MUNICIPAL BOUNDARY LINES
9	REGIONAL ROADS	▨	EXISTING AND DESIGNATED DEVELOPMENT AREAS
┼┼┼	RAILWAY LINES		

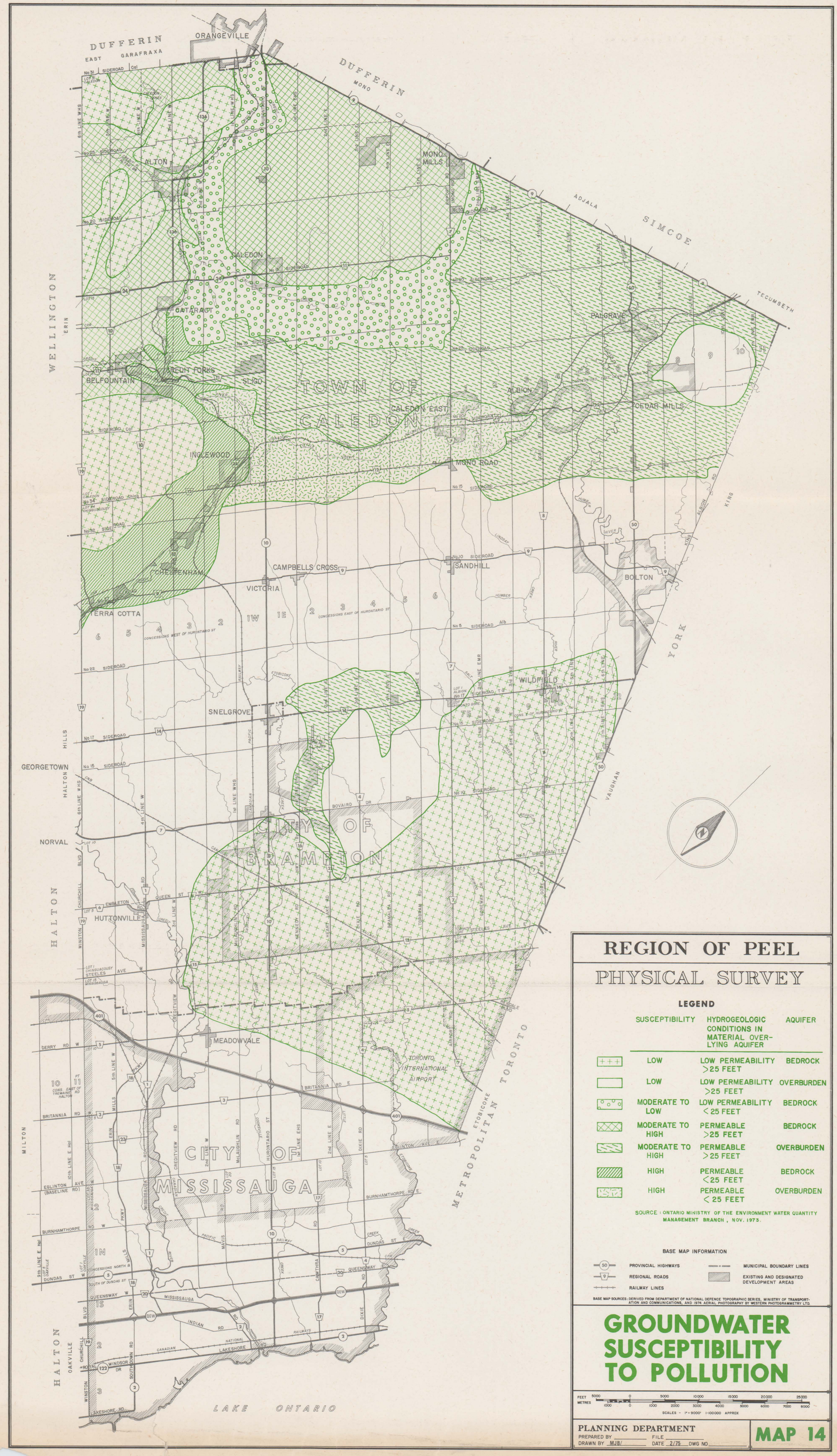
BASE MAP SOURCES: DERIVED FROM DEPARTMENT OF NATIONAL DEFENCE TOPOGRAPHIC SERIES, MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, AND 1974 AERIAL PHOTOGRAPHY BY WESTERN PHOTOGRAMMETRY LTD.

PROBABLE WELL YIELDS

FEET 5000 0 5000 10000 15000 20000 25000
METRES 1000 0 1000 2000 3000 4000 5000 6000 7000 8000
SCALES – 1" = 9000' 1:100000 APPROX

PLANNING DEPARTMENT
PREPARED BY ______ FILE ______
DRAWN BY MJB/ DATE 2/75 DWG NO ______

MAP 13



REGION OF PEEL

PHYSICAL SURVEY

LEGEND

	SUSCEPTIBILITY	HYDROGEOLOGIC CONDITIONS IN MATERIAL OVER-LYING AQUIFER	AQUIFER
+++	LOW	LOW PERMEABILITY >25 FEET	BEDROCK
☐	LOW	LOW PERMEABILITY >25 FEET	OVERBURDEN
° ° °	MODERATE TO LOW	LOW PERMEABILITY < 25 FEET	BEDROCK
⊠	MODERATE TO HIGH	PERMEABLE >25 FEET	BEDROCK
▧	MODERATE TO HIGH	PERMEABLE >25 FEET	OVERBURDEN
▨	HIGH	PERMEABLE <25 FEET	BEDROCK
⁘	HIGH	PERMEABLE < 25 FEET	OVERBURDEN

SOURCE : ONTARIO MINISTRY OF THE ENVIRONMENT WATER QUANTITY MANAGEMENT BRANCH , NOV. 1973.

BASE MAP INFORMATION

(50)	PROVINCIAL HIGHWAYS	— · —	MUNICIPAL BOUNDARY LINES
9	REGIONAL ROADS	▨	EXISTING AND DESIGNATED DEVELOPMENT AREAS
+++	RAILWAY LINES		

BASE MAP SOURCES: DERIVED FROM DEPARTMENT OF NATIONAL DEFENCE TOPOGRAPHIC SERIES, MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, AND 1974 AERIAL PHOTOGRAPHY BY WESTERN PHOTOGRAMMETRY LTD.

GROUNDWATER SUSCEPTIBILITY TO POLLUTION

FEET 5000 0 5000 10000 15000 20000 25000
METRES 1000 0 1000 2000 3000 4000 5000 6000 7000 8000
SCALES - 1" = 9000' 1:100000 APPROX

PLANNING DEPARTMENT

PREPARED BY ______ FILE ______
DRAWN BY MJB/ DATE 2/75 DWG NO ______

MAP 14

CHAPTER X

SOIL TYPES

As discussed earlier in this Report, the Region of Peel is covered by material deposited by melting ice of the Wisconsin Glaciation. In some areas, the deposit of material over the underlying bedrock is thin, particularly in the southern and northwestern parts of the Region.

The unsorted material deposited by ice is generally referred to as till, and consists of an accumulation of particles of all possible sizes from clay and silt to sand and gravel, with a varying proportion of stones and boulders. There are five main types of till in Peel Region:

1) Coarse, open limestone and shale till.
2) Medium textured limestone and shale till.
3) Medium textured shale and limestone till.
4) Fine textured limestone and shale till.
5) Fine textured shale and limestone till.[1]

1) Coarse, open limestone and shale till

This till occurs in small areas in the northern part of Peel Region, particularly in the district south of Mono Mills. It is characterized by a lack of sorting, and contains large numbers of stones of varying size throughout the matrix of sand, silt and clay.[2]

2) Medium textured limestone and shale till

Medium textured limestone and shale till occurs most commonly in the former Township of Caledon. It exhibits a lack of sorting and contains fewer stones scattered throughout the matrix of sand, silt and clay than are evident in the coarse limestone materials. This till occurs in gently to moderately sloping plains having characteristic drumlinoid features.[3]

3) Medium textured shale and limestone till

This till is found predominantly in the Kilmanagh district of Peel Region. It contains a larger amount of shale than the till described in 2) above.

4) Fine textured limestone and shale till

Deposits of fine textured limestone and shale till are found in the former Township of Albion in the area north of Bolton. This material occurs in gently to steeply sloping plains and lacks the drumlinoid features of the medium textured tills further west.[4]

5) Fine textured shale and limestone till

Fine textured shale and limestone till is the dominant soil material found in Peel. Large areas of this till occur in the City of Mississauga and the former Township of Chinguacousy. This soil material is usually heavy textured with few stones. The associated topography ranges from very gently to moderately sloping.[5]

In addition to the tills, the following other soil parent materials are found in Peel:

1) Poorly sorted sands

Poorly sorted glacio-fluvial sands occupy a large area in the northern part of the Region. These sands have smooth, steep slopes and may contain pockets of till and gravel.[6]

2) Well sorted sands and gravel

A large area of the northwestern part of Peel is occupied by well sorted gravels. Smaller areas of well sorted sand occur throughout the Region. The well sorted gravel ranges in topography from very gently sloping to moderately sloping; whereas, the surface of the sands is usually gently sloping.[7]

3) Well sorted sands underlain by clay till

In some parts of the Region of Peel deposits of sand three feet and less in depth are underlain by clay till.

4) Lacustrine clays underlain by clay till

A portion of the City of Mississauga and of the former Townships of Toronto Gore and Albion was covered by glacial Lake Peel for a period of time. This resulted in the deposition of shallow lacustrine material over clay till. The topography varies from smooth moderately sloping to smooth very gently sloping.[8]

5) Shallow soils over bedrock

Exposed bedrock and shallow soils over bedrock occur mainly in the southern and western part of the Region.

6) Organic soils

Organic deposits occur in small areas scattered chiefly over the northern part of the Region. They are largely the remains of decayed trees, herbs and mosses. The organic materials in Peel form muck soils.[9]

Evolving from the ice-deposited till and other parent materials are the different soils, which may be defined as porous media comprising finely divided organic and mineral particles, rigid inactive grains (sand), and pores that contain water and gas.[10] Soils develop from parent materials as a result of the combined effects of climate (temperature, precipitation), organisms (plants, animals, insects, microorganisms), the nature of the parent materials, topography and time (the relative duration of soil-forming processes).[11]

The different soils in Peel are summarized in the accompanying Table according to the associated parent materials. With the exception of Recent Alluvium (located along watercourses), the distribution of the soil parent materials is illustrated on Map 15. For the distribution of the different soil types in Peel (as distinct from soil parent materials), reference should be made to the Map accompanying the Soil Survey of Peel County, a copy of which is available for use in the Regional Planning Department.

Table 9

CATEGORIZATION OF PEEL REGION SOILS ACCORDING TO SOIL PARENT MATERIALS AND DRAINAGE[12] (1953)

TILL PARENT MATERIALS

1) Soils Developed on Coarse, Open, Limestone and Shale Till

	Acreage	% of Total[13]
A. Good Drainage		
a) Dumfries loam	8,200	2.7
b) Dumfries sandy loam	2,400	0.8
B. Poor Drainage		
a) Lily loam	300	0.1

2) Soils Developed on Medium Textured Limestone and Shale Till

A. Good Drainage		
a) Harriston loam	10,400	3.5
B. Imperfect Drainage		
a) Listowel	1,100	0.4
C. Poor Drainage		
a) Parkhill loam	2,200	0.7

3) Soils Developed on Medium Textured Shale and Limestone Till

A. Good Drainage		
a) Woburn loam	3,800	1.3
B. Imperfect Drainage		
a) Milliken loam	2,200	0.7
C. Poor Drainage		
a) Lyons loam	200	0.06

4) Soils Developed on Fine Textured Limestone and Shale Till

A. Good Drainage		
a) King clay loam	13,200	4.4
B. Imperfect Drainage		
a) Monaghan clay loam	200	0.06

5) Soils Developed on Fine Textured Shale and Limestone Till[14]

A. Good Drainage		
a) Oneida clay loam	20,500	6.8

	Acreage	% of Total
B. Imperfect Drainage		
a) Chinguacousy clay loam	68,500	22.8
C. Poor Drainage		
a) Jeddo clay loam	5,600	1.9

OTHER PARENT MATERIALS

1) Soils Developed on Poorly Sorted Sands

A. Good Drainage		
a) Pontypool sandy loam	46,300	15.4

2) Soils Developed on Well Sorted Sands and Gravels

Sands

A. Good Drainage		
a) Fox sandy loam	6,700	2.2
b) Fox sand	6,900	2.3
c) Brighton sandy loam	3,300	1.1
B. Imperfect Drainage		
a) Brady sandy loam	1,300	0.4

Gravels

A. Good Drainage		
a) Caledon loam	10,200	3.4
B. Poor Drainage		
a) Gilford loam	1,100	0.4

3) Soils Developed on Well Sorted Sands Underlain by Clay Till

A. Good Drainage		
a) Bookton sandy loam	1,000	0.3
B. Imperfect Drainage		
a) Berrien sandy loam	800	0.3

4) Soils Developed on Lacustrine Clays Underlain by Clay Till

A. Good Drainage		
a) Cashel clay	500	0.2
B. Imperfect Drainage		
a) Peel clay	33,900	13.1
C. Poor Drainage		
a) Malton clay	5,000	1.7

5) Shallow Soils Over Bedrock

	Acreage	% of Total
Formed Over Gray Shale		
A. Good Drainage		
a) Brockport clay loam	700	0.2
B. Imperfect Drainage		
a) Cooksville clay loam	5,100	1.7
C. Poor Drainage		
a) Mississauga clay loam	600	0.2
Formed Over Red Shale		
A. Good Drainage		
a) Lockport clay	1,500	0.5
B. Imperfect Drainage		
a) Trafalgar clay	1,100	0.4
Formed Over Limestone		
A. Good Drainage		
a) Farmington	4,000	1.3

6) Organic Soils

A. Very Poor Drainage		
a) Muck	4,500	1.5

7) Recent Alluvial Materials

a) Bottom land	25,800	8.6

REFERENCE NOTES

[1] Hoffman, D. W. and Richards, N.R., Soil Survey of Peel County, Report No. 18 of the Ontario Soil Survey, Guelph, Ontario, Experimental Farm Service, Canada Department of Agriculture and the Ontario Agricultural College (November, 1953), p. 14.

[2] *Ibid.*

[3] *Ibid.*

[4] *Ibid.*, p. 15.

[5] *Ibid.*, pp. 14-15.

[6] *Ibid.*, p. 15.

[7] *Ibid.*

[8] *Ibid.*, p. 16

[9] *Ibid.*

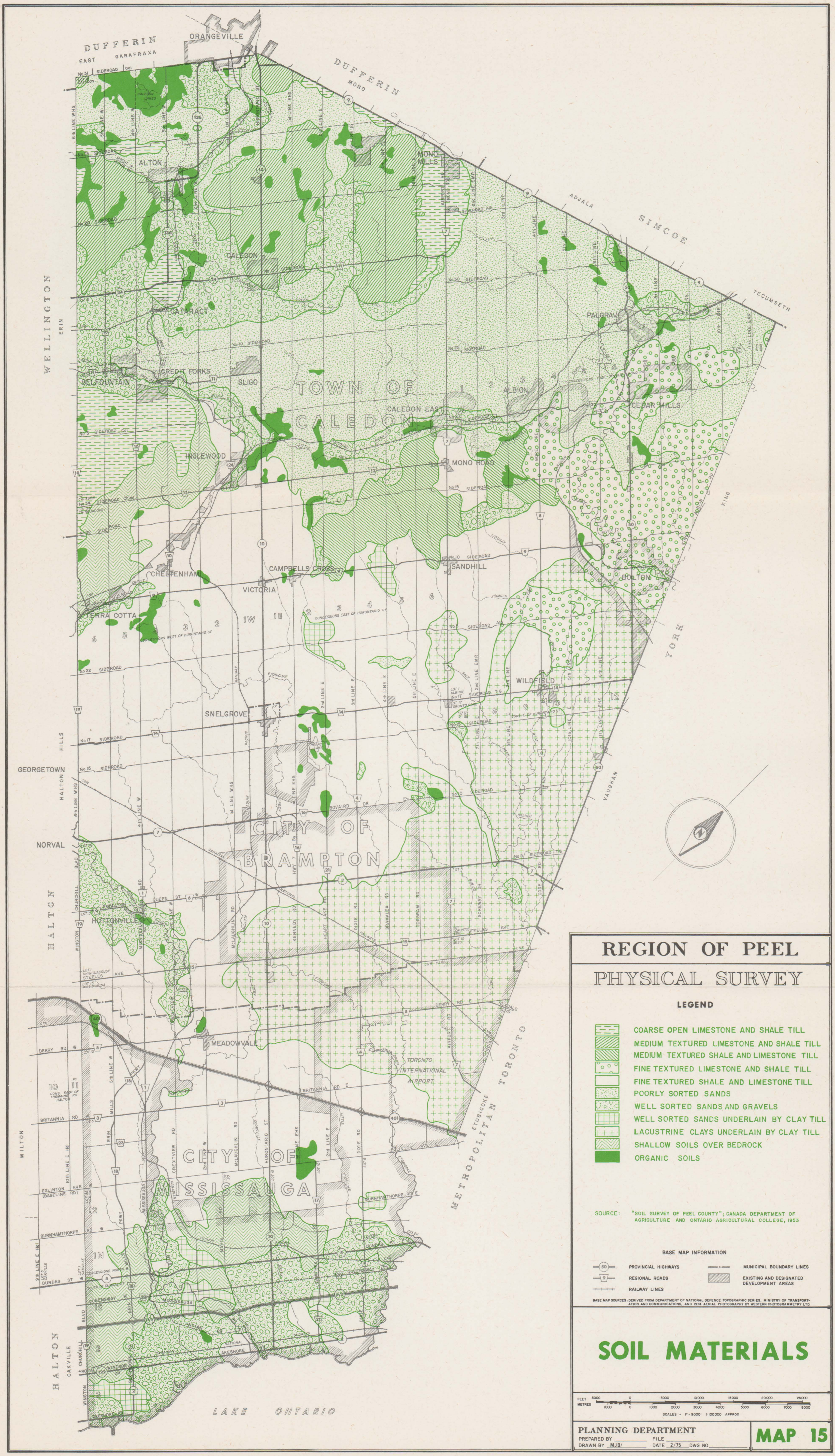
[10] L. R. Webber, ed., Ontario Soils : Physical, Chemical and Biological Properties and Principles of Soil Management, Guelph Ontario : Ontario Agricultural College (1964) and Ontario Department of Agriculture, p. 12.

[11] *Ibid.*, p. 6.

[12] Hoffman, D.W. and Richards, N.R., *op. cit.*, pp. 27-29.

[13] The total area of Peel in this Table relates to the former County of Peel and not to the Region of Peel, which includes a part of what was Halton County. All acreage figures are dated at 1950.

[14] The part of Peel Region which formerly belonged to Halton County contains soils in this group. The 1950 acreage and percentage figures, therefore, are inaccurate for Peel Region in Group 5) under Till Parent Materials.



REGION OF PEEL

PHYSICAL SURVEY

LEGEND

▤	COARSE OPEN LIMESTONE AND SHALE TILL
▨	MEDIUM TEXTURED LIMESTONE AND SHALE TILL
▧	MEDIUM TEXTURED SHALE AND LIMESTONE TILL
○	FINE TEXTURED LIMESTONE AND SHALE TILL
☐	FINE TEXTURED SHALE AND LIMESTONE TILL
▒	POORLY SORTED SANDS
◌	WELL SORTED SANDS AND GRAVELS
▦	WELL SORTED SANDS UNDERLAIN BY CLAY TILL
+	LACUSTRINE CLAYS UNDERLAIN BY CLAY TILL
▩	SHALLOW SOILS OVER BEDROCK
■	ORGANIC SOILS

SOURCE: "SOIL SURVEY OF PEEL COUNTY"; CANADA DEPARTMENT OF AGRICULTURE AND ONTARIO AGRICULTURAL COLLEGE, 1953

BASE MAP INFORMATION

50	PROVINCIAL HIGHWAYS	▬ • ▬	MUNICIPAL BOUNDARY LINES
9	REGIONAL ROADS	▨	EXISTING AND DESIGNATED DEVELOPMENT AREAS
┼┼┼	RAILWAY LINES		

BASE MAP SOURCES: DERIVED FROM DEPARTMENT OF NATIONAL DEFENCE TOPOGRAPHIC SERIES, MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, AND 1974 AERIAL PHOTOGRAPHY BY WESTERN PHOTOGRAMMETRY LTD.

SOIL MATERIALS

FEET 5000 0 5000 10000 15000 20000 25000
METRES 1000 0 1000 2000 3000 4000 5000 6000 7000 8000
SCALES - 1" = 9000' 1:100000 APPROX

PLANNING DEPARTMENT
PREPARED BY ________ FILE ________
DRAWN BY MJB/ DATE 2/75 DWG NO ________

MAP 15

CHAPTER XI

AGRICULTURE

Soil Capability for Agriculture

The soil capability classification for agricultural purposes is one of a number of interpretive groupings that may be made from soil survey data.[1] In the classification used for this Report, soils are grouped into seven classes according to their potentialities and limitations for agricultural use. The first three classes are considered capable of sustained production of common cultivated crops, the fourth is marginal for sustained arable culture, the fifth is capable of use only for permanent pasture and hay, the sixth is capable of use only for wild pasture, while the seventh class is for soils and land types (including rock outcrop and small bodies of water) considered incapable of use for arable culture or permanent pasture. While the soil areas in classes one to four are capable of use for cultivated crops, they are also capable of use for perennial forage crops. Soil areas in all classes may be suited for forestry, wildlife and recreation.[2]

The soil capability classification is based on the following assumptions.

1) The soil capability classification is an interpretive classification based on the effects of combinations of climate and soil characteristics on the agricultural use limitations of the soils, and on the soils' general productive capacity for common field crops. Shrubs, trees or stumps are not considered as limitations to use, unless it is not feasible to remove them.

2) Good soil management practices that are feasible and practical under a largely mechanized system of agriculture are being implemented.

3) The soils within a capability class are similar with respect to degree, but not to kind of limitations in soil use for agricultural purposes. Each class includes many kinds of soil, and the soils within any one class may require different management and treatment techniques.

4) Soils considered feasible for improvement by draining, by irrigating, by removing stones, by altering soil structure, or by protecting from overflow, are classified according to their continuing limitations or hazards in use after the improvements have been made. The term "feasible" implies that it is generally considered to be within present day economic possibility for the farmer to make such improvements and that a major reclamation project is not required. Where such major products have been undertaken, the soils are grouped according to the soil and climatic limitations that continue to exist. Generally speaking, a major reclamation project is one which requires co-operative action among farmers or between farmers and governments. Minor dams, small dykes, or field conservation measures are not included.

5) The capability classification of the soils in an area may be changed when major reclamation projects are undertaken that permanently change the agricultural use limitations.

6) Distance to market, kind of roads, location, size of farms, characteristics of land-ownership and cultural patterns, and the skill or resources of individual operators are not criteria for capability groupings.

7) Capability groupings are subject to change as new information about the behaviour and responses of the soils becomes available.[3]

Capability Classes

Class 1 - Soils in this class have no significant limitations in use for crops.

Soils in Class 1 are level or have very gentle slopes. They are deep, well to imperfectly drained and have good water-holding capacity. They are easily maintained in good tilth and productivity, and damage from erosion is slight. They are moderately high to high in productivity for a wide range of field crops.[4]

Class 2 - Soils in this class have moderate limitations that restrict the range of crops or require moderate conservation practices.

Soils in Class 2 are deep and have a good water-holding capacity. The limitations are moderate and the soils can be managed and cropped with little difficulty. The soils are moderately high to high in productivity for a fairly wide range of field crops. Soils in this class are not generally suited to as wide a range of crops as the soils in Class 1. Also, more intensive conservation measures, tillage practices, or special soil-conserving systems may be required.[5]

Yields of common field crops (corn, barley, oats) will be 80 ± 3 percent of those obtained on Class 1 soils.[6]

Class 3 - Soils in this class have moderately severe limitations that restrict the range of crops or require special conservation practices.

Soils in Class 3 have more severe limitations than those in Class 2 and conservation practices are more difficult to apply and maintain. Under good management, these soils are fair to moderately high in productivity for a fairly wide range of field crops.[7]

Yields of common field crops will be 64 ± 4 percent of those obtained on Class 1 soils.[8]

Class 4 - Soils in this class have severe limitations that restrict the range of crops or require special conservation practices or both.

Soils in Class 4 have such limitations that they are only suitable for a few crops, or the yield for a range of crops is low, or the risk of crop failure is high. The limitations may seriously affect such farm practices as the timing and ease of tillage, planting and harvesting, and the application and maintenance of conservation practices. These soils are low to medium in productivity for a narrow range of crops but may have higher productivity for a specially adapted crop.[9]

Yields of common field crops will be 44 ± 6 percent of those obtained on Class 1 soils.[10]

Class 5 - Soils in this class have very severe limitations that restrict their capability to producing perennial forage crops. Improvement practices are feasible.

Soils in Class 5 have such serious soil, climatic or other limitations that they are not capable of use for sustained production of annual field crops. However, they may be improved by the use of farm machinery for the production of native or tame species of perennial forage plants. Feasible improvement practices include clearing of bush, cultivation, seeding, fertilizing and water control.

Some soils in Class 5 can be used for cultivated field crops provided unusually intensive management practices are used. Some of the soils in this class are also adapted to special crops such as blueberries, orchard crops, or the like, requiring soil conditions unlike those needed by more common crops. Cultivated field crops may be grown in Class 5 areas where adverse climate is the main limitation, but crop failures will occur under average conditions.[11]

Class 6 - Soils in this class are capable only of producing perennial forage crops. Improvement practices are not feasible.

Soils in Class 6 have some natural sustained grazing capacity for farm animals,but have such serious soil, climatic or other limitations as to make impractical the application of improvement practices that can be carried out in Class 5. Soils may be placed in this class because their physical nature prevents improvement by the use of farm machinery, or the soils are not responsive to improvement practices or because of a short grazing season, or because stock watering facilities are inadequate. Such improvement as may be effected by seeding and fertilizing by hand or by aerial methods will not change the classification of these soil areas.[12]

Class 7 - Soils in this class have no capability for arable culture or permanent pasture.

The soils or lands in Class 7 have limitations so severe that they are not capable of use for arable culture or permanent pasture. All classified areas (except organic soils) not included in Classes 1 to 6 are placed in this class. Bodies of water too small to delineate on the map are included in this class.

Class 7 soils may or may not have a high capability for trees, native fruits, wildlife and recreation. Hence,no inferences can be made as to the capability of the soils and land types in this class beyond their capability for agriculture.[13]

Organic Soils - Soils that contain 30 percent or more organic matter and have a depth of 12 inches or more of consolidated organic material.

The interpretive soil capability classification is not applied to organic soils since, in general, there is insufficient information on these organic soil areas to make such an interpretive judgment.[14]

On map 16 of this Report, soil capability classes have been grouped as follows:

Group 1:	Classes 1, 2 and 3
Group 2:	Classes 4 and 5
Group 3:	Classes 6 and 7
Group 4:	Organic

This arbitrary grouping was done in order to simplify the Map and to emphasize the good to excellent agricultural soil areas (Group 1) in Peel. A more detailed Map showing the individual capability classes is available for reference in the Region of Peel Planning Department.

Acreages in the various Classes of Soil Capability for Agriculture in Peel (1970) are summarized in the following Table. It should be noted that these acreage figures do not reveal the amount of land available to agriculture in 1970, and certainly not in 1975. A considerable acreage included in these figures has been developed or has been set aside for urban and open space recreational uses. Furthermore, acreages relate to Peel County and therefore do not incorporate that part formerly in Halton County (Oakville area), which is now included in the Region of Peel.

TABLE 10

ACREAGES OF SOIL CAPABILITY FOR AGRICULTURE IN PEEL[15]

(1970)

MUNICIPALITY	SOIL CLASSES								
	1	2	3	4	5	6	7	Organic	Total
Albion Township	18,780	2,750	9,730	12,185	-	13,900	-	385	57,730
Caledon Township	6,725	22,080	9,420	11,520	320	15,475	320	2,750	68,610
Chinguacousy Township	60,870	2,155	9,110	8,030	-	2,460	1,150	895	84,670
Toronto Gore Township	16,390	770	1,790	1,790	-	-	-	-	20,740
Town of Mississauga	41,460	2,935	14,205	8,785	575	-	-	450	68,410
Total (Peel County)	144,225	30,690	44,255	42,310	895	31,835	1,470	4,480	300,160
% of Total Area of Peel County (300,160 acres)	48.1%	10.2%	14.7%	14.1%	0.3%	10.6%	0.5%	1.5%	100%

As noted from this Table, Group 1 (Classes 1, 2 and 3) occupied 219,170 acres or 73% of the County of Peel. Group 2 (Classes 4 and 5) occupied 43,205 acres or 14.4%. Group 3 (Classes 6 and 7) occupied 33,305 acres or 11.1%. Group 4 (Organic) occupied 4,480 acres or 1.5%.

Existing Agriculture

In 1971, there were 1,102 Census farms in Peel County with a combined area of 163,588 acres. Comparative figures for 1966 are 1,401 Census farms with an area of 201,618 acres.[16]

A Census farm is defined by Statistics Canada as an agricultural holding of one acre or more with sales of agricultural products during the twelve months prior to June 1st of the Census year (e.g. 1971) of $50.00 or more.[17]

The 1971 breakdown of improved and unimproved agricultural land in Peel County is as follows:[18]

Improved Land Area

Under Crops	-	94,618 acres
Improved Pasture	-	28,113 acres
Summer Fallow	-	3,938 acres
Other	-	4,855 acres
Total	-	131,524 acres

Unimproved Land Area

Woodland	-	8,646 acres
Other	-	23,418 acres
Total	-	32,064 acres

The amount of land devoted to agriculture in Peel has decreased quite markedly over the years as evidenced by the next set of figures.[19]

Acreage of Improved Farm Land in Peel County

1951 - 201,822 acres
1956 - 188,499 acres
1961 - 173,279 acres
1966 - 163,529 acres
1971 - 131,524 acres

Acreage of Improved Pasture in Peel County

1951 - 51,261 acres
1956 - 62,877 acres
1961 - 54,590 acres
1966 - 38,930 acres
1971 - 28,113 acres

An accurate 1974/75 picture of agriculture in Peel does not currently exist. In other words, a detailed rural land use survey and farm classification for all of rural Peel has not yet been undertaken. In order to remedy this situation, it is proposed that a detailed rural land use survey be conducted during the summer and fall of this year (1975). In addition, acreage figures relating to soil capability classes will be adjusted to recognize existing and committed development areas in the Region.

It should be noted that the emphasis in this Chapter has been on the natural capability of the soil in the various parts of the Region to sustain production of common cultivated crops. This natural capability does not necessarily preclude the success of certain farm operations, particularly those which do not involve the growing of common cultivated crops.

REFERENCE NOTES

[1] *The Canada Land Inventory, Report No. 2-1965, Soil Capability Classification for Agriculture*, Ottawa, Canada Department of Forestry (1966), p. 3.

[2] *Ibid*.

[3] *Ibid*., p. 5.

[4] *Ibid*.

[5] *Ibid*.

6 D. W. Hoffman, *The Assessment of Soil Productivity for Agriculture, Report No. 4*, conducted under the Canada Land Inventory Program, A.R.D.A., Guelph, Ontario, (November, 1971), p. 42.

[7] *The Canada Land Inventory, Report No. 2-1965*, p.p. 5-7.

[8] D. W. Hoffman, *op*. *cit*., p. 42.

[9] *The Canada Land Inventory, Report No. 2-1965*, p. 7.

[10] D. W. Hoffman, *op*. *cit*., p. 42.

[11] *The Canada Land Inventory, Report No. 2-1965*, p. 7.

[12] *Ibid*., p.p. 7-9.

[13] *Ibid*., p. 9.

[14] *Ibid*., p. 11.

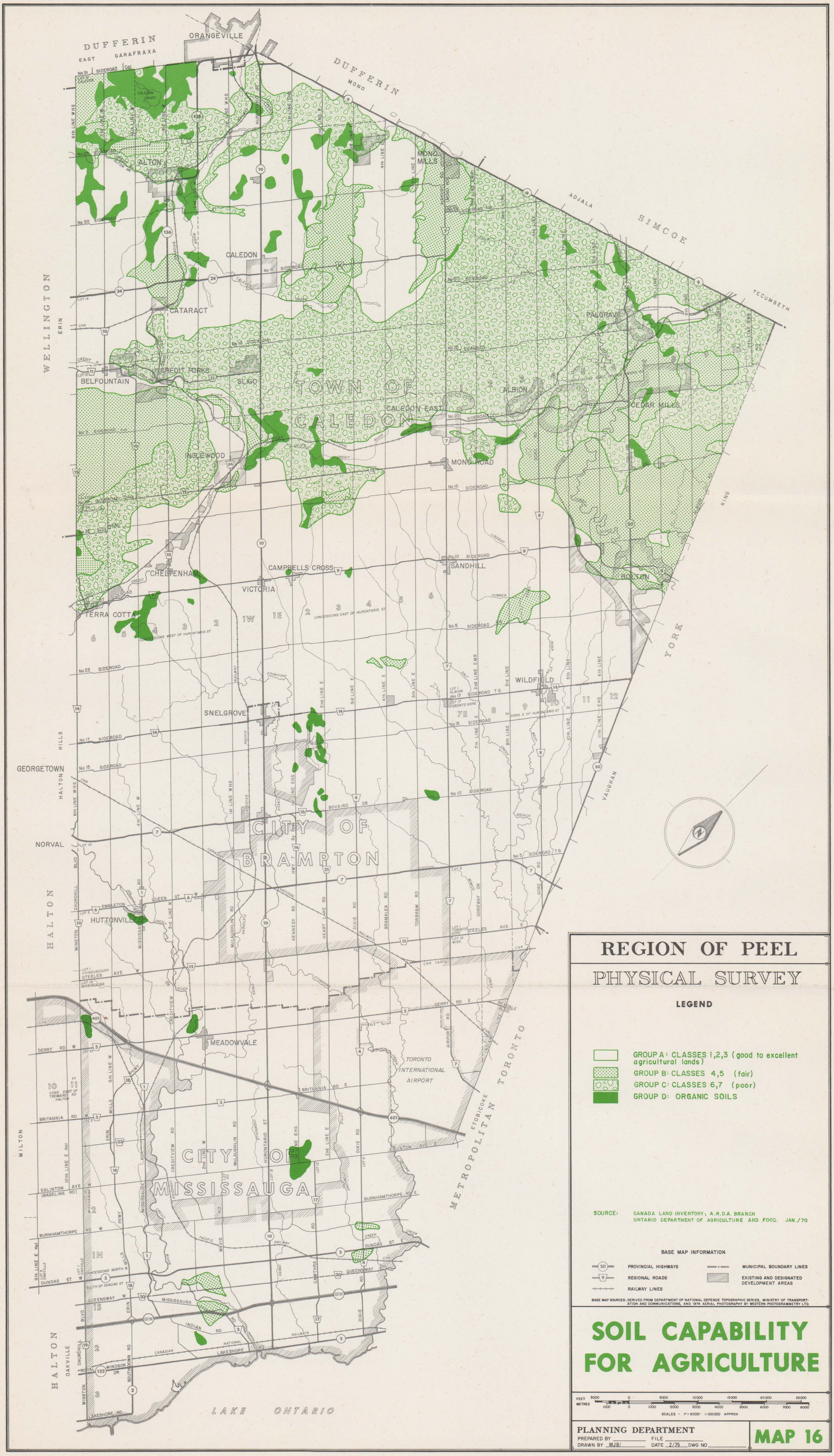
[15] The Canada Land Inventory, A.R.D.A. Branch, Ontario Department of Agriculture and Food, *Land Use Capability for Agriculture: Acreages by Counties and Townships in Ontario*, Toronto, Ontario (January, 1970) p. 44.

[16] Statistics Canada, *Census of Canada, 1966 and 1971*.

[17] Statistics Canada, *Census of Canada, 1971*.

[18] *Ibid*.

[19] *Ibid*.



REGION OF PEEL

PHYSICAL SURVEY

LEGEND

☐	GROUP A: CLASSES 1,2,3 (good to excellent agricultural lands)
▨	GROUP B: CLASSES 4,5 (fair)
▨	GROUP C: CLASSES 6,7 (poor)
■	GROUP D: ORGANIC SOILS

SOURCE: CANADA LAND INVENTORY; A.R.D.A. BRANCH
ONTARIO DEPARTMENT OF AGRICULTURE AND FOOD. JAN./70

BASE MAP INFORMATION

50	PROVINCIAL HIGHWAYS		MUNICIPAL BOUNDARY LINES
9	REGIONAL ROADS	▨	EXISTING AND DESIGNATED DEVELOPMENT AREAS
	RAILWAY LINES		

BASE MAP SOURCES: DERIVED FROM DEPARTMENT OF NATIONAL DEFENCE TOPOGRAPHIC SERIES, MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, AND 1974 AERIAL PHOTOGRAPHY BY WESTERN PHOTOGRAMMETRY LTD.

SOIL CAPABILITY FOR AGRICULTURE

PLANNING DEPARTMENT
PREPARED BY ________ FILE ________
DRAWN BY MJB/ DATE 2/75 DWG NO ________

MAP 16
]

CHAPTER XII

FORESTRY

Survey of Existing Forest and Woodlands

The forest and woodlands survey of the Region of Peel was carried out by interpreting aerial photographs taken in May of 1974, and by compiling data and information from the 1957 Forest Resources Inventory (Ontario Department of Lands and Forests). Other sources of information include reports and materials made available in January 1975 by the Ontario Ministry of Natural Resources, the Credit Valley Conservation Authority and the Metropolitan Toronto and Region Conservation Authority. Information on Land Capability for Forestry in the Region of Peel was obtained from the Soil Survey of Peel County (1953) and the Canada Land Inventory.

Regional Forest Types

According to the 1957 Forest Resources Inventory, the natural vegetation of Peel County is divided into two ecological divisions: the Huron Section and the Niagara Section (note Figure 8). The soil materials in the Huron Section primarily consist of limestone, shale, sandstone and dolomite, overlain by glacial materials. The prevailing vegetative association is a broadleaf forest in which Oak, Sugar Maple, Pine and Beech are the most commonly occurring species. Hemlock, White Pine, Spruce, Basswood, Ash, Red Maple, Hickory, Ironwood and Black Cherry all occur in this Section. The Niagara Section consists predominately of broadleaf trees. A variety of species, many in small stands, grow in the area that is largely urban.

Table 11 shows the old County of Peel principal land classifications by Townships. In 1957, there was a total of 25,372 acres of productive forest land, which represented about 9 percent of the total land area in Peel County.

Table 11

Principal Land Classifications by Townships
(1957)

TOWNSHIPS	TOTAL LAND ACREAGE	FOREST LAND				AGRICULTURAL LAND						URBAN AREAS	
		PRODUCTIVE		NON-PRODUCTIVE		DEVELOPED		ACRES		WOODED PASTURE			
		ACRES	%	ACRES	%	ACRES	%	ACRES	%	ACRES	%	ACRES	%
Albion	57,488	5,948	10.4	716	1.2	33,356	58.0	12,488	21.7	3,092	5.4	1,888	3.3
Caledon	69,478	11,766	16.9	2,486	3.6	34,940	50.3	14,170	20.4	4,250	6.1	1,866	2.7
Chinguacousy	83,064	4,942	6.0	524	0.6	61,742	74.3	8,784	10.6	3,252	3.9	3,820	4.6
Toronto	67,104	2,538	3.8	140	0.2	36,274	54.1	6,738	10.0	1,648	2.4	19,766	29.5
Toronto Gore	19,020	178	0.9			14,888	78.3	2,294	12.1	690	3.6	970	5.1
Peel County	296,154	25,372	8.6	3,866	1.3	181,200	61.2	44,474	15.0	12,932	4.4	28,310	9.5

Source: *Forest Resources Inventory*, Ontario Department of Lands and Forests, 1957.

Note: Above table is for Peel County and does not include the area formerly in Halton County and incorporated into the Region of Peel.

Woodland Classifications[2]

Productive Woodland:	Areas which are capable of producing timber of of a commercial character, and which are actively being used for such purposes.
Non-Productive Woodland:	Areas (including swamps and wetlands) which appear to be permanently out of the commercial timber producing classification due to low productivity.
Developed Agricultural Land:	Cultivated land which is producing crops, or is devoted to market gardens or orchards.
Meadow:	Areas devoted to pasture for domesticated animals.
Wooded Pasture:	Areas of low density forest stands that are generally quite heavily grazed.
Forest Management Areas:	Publicly and privately owned lands which are managed for conservation and reforestation purposes under The Woodlands Improvement Act by either the Conservation Authorities or the Ontario Ministry of Natural Resources.

Forest and Woodland Coverage

In view of the absence of a detailed forestry field survey on types of species, maturity of stands, age classes and volumes in cubic feet of primary growing stock, the forests and woodlands in the Region of Peel are shown only as Existing Woodlots on Map 17. At present, there is an estimated total of about 41,110 acres of woodland in Peel (11,872 acres or 41% more than in 1957). Of this, 4,000 acres are in swamp and bush land, and 37,110 acres are in productive woodlands. The woodland coverage by Area Municipality in Peel is set out in Table 12 .

Table 12

Region of Peel Woodland Coverage

Municipality	Total Land Area		Woodland Coverage	
	Sq. Miles	Acres	Acres	%
Town of Caledon	270.4	173,043	36,817	21.28
City of Brampton	104.0	66,566	2,119	3.18
City of Mississauga	113.3	72,519	2,174	3.00
Total, Region of Peel	487.7	312,128	41,110	13.17

Source: Region of Peel Planning Department, 1975.
Calculation made by using 1974 aerial photographs.

Forest Management Areas

The forest management areas in the Region of Peel consist of two categories: 1) Public Forest Management Areas and 2) Private Reforestation Areas (see Map 18).

Public Forest Management Areas

The public forest conservation and management areas consist of a total of approximately 2,566 acres. Of this total, the Town of Caledon owns about 50 acres in an area located immediately south of Highway #24 and west of Second Line West. This site is an abandoned gravel pit which is being rehabilitated for reforestation purposes. The Credit Valley Conservation Authority owns approximately 769 acres in the form of Forest Conservation Areas, and the Metropolitan Toronto and Region Conservation Authority owns about 1,404 acres, all in the Humber Forest Conservation and Management Area. The Peel Board of Education owns about 174 acres near Terra Cotta for conservation and nature study purposes; and in late 1974, the Board acquired a second property (169 acres) in the Caledon Lake Conservation Area for future use in educational programs.

The public forest management areas in the Region of Peel are summarized in Table 13.

Table 13

Public Forest Management Areas in the Region of Peel

OWNERSHIP	LOCATION	ACREAGE (1975)	REMARKS
Credit Valley Conservation Authority	Caledon Lake Conservation Area-Conc. IV and V, part of Lot 29, 30 and 31 Caledon Township.	457.8	Purchased in 1963 and 1965 to preserve the wetlands which are extremely fragile and contain flora and fauna not found anywhere else in the Province.
	Conc. IV, west half of Lot 19, on the 4th Line West in Caledon Township.	100	Purchased in 1955 for forest protection and reforestation.
	Conc. VI, west half of Lot 6, on the 6th Line West in Caledon Township.	90	Purchased in 1957 for forest conservation and reforestation purposes.
	Conc. IV, East, east half of Lot 35 on the 4th Line East in Caledon Township.	70	Acquired in 1964 for reforestation.
	Terra Cotta Conservation Area:* multiple-use area Conc. 9, 10 and 11 in Esquesing Township	51.0	Purchased in 1958 and 1971 for multiple-uses such as recreation and forest management. The site is located outside of the Region, however, it is heavily used by the public from Peel.
Sub-total		768.8	
Metropolitan Toronto and Region Conservation Authority	Caledon Township, Conc. V NE/4 of Lot 16, and east half of Lot 17, 18 19 and 20.	449.8	Owned by the MTRCA and managed by the MNR as part of the Humber Forest experimental areas.
	Township of Albion .		
	Conc. III, NW/4 of Lot 13	30.0	
	Conc. III, West half of Lot 24	98.0	
	Conc. IV, east half of Lot 18	90.2	
	Conc. V, west half of Lot 19	100.0	
	Conc. V, east half of Lot 22	100.0	
	Conc. V, NE/4 of Lot 24	50.0	
	Conc. V E/2 of Lot 25	92.1	
	Conc. V Lot 29	197.1	
	Conc. IV Lot 28	196.6	
Sub-Total		1,403.7	
Town of Caledon	Conc. IV WHS Lot 15	50.0	An abandoned gravel pit used for reforestation after rehabilitation
Peel Board of Education	Conc. X, Lot 29 in Halton* Hills (Terra Cotta)	174.0	Owned and managed by the Peel Board of Education for field studies.
	Conc. IV, Lot 28	169.0	Acquired in late 1974 for nature studies.
Sub-Total		343.0	
Region of Peel		2,565.5	

Sources: 1) Annual Reports of the Metropolitan Toronto and Region Conservation Authority and the Credit Valley Conservation Authority, 1973, 74.

2) Maple District, Ontario Ministry of Natural Resources (Data provided in January, 1975).

3) Planning Department, Peel Board of Education.

Private Forest Management Areas

The provisions of The Forestry Act and The Woodlands Improvement Act permit the Ministry of Natural Resources to enter into agreements with the owners of lands that are suitable for reforestation or forest conservation purposes. An agreement relates to a parcel of land (minimum area of one acre) for a stated period of more than twenty years, and provides that the Province will assume responsibility for reforestation and for subsequent care of the woodlands. At present, there are forty-one parcels of privately-owned land (a total of 1,340 acres) which are covered by agreements between the owners and the Ministry of Natural Resources under The Woodlands Improvement Act.

Land Capability for Forestry

The Canada Land Inventory was the principal source in the preparation of Map 19 (Land Capability for Forestry).

In the Land Capability for Forestry classification, all mineral and organic soils are classified in one of seven classes according to an inherent ability to grow commercial timber. The classification is based upon the following major factors: soil types, moisture and fertility conditions, climate, natural vegetation; and the productivity range, which is determined according to the mean annual increment of the best species, or group of species, adapted to the site at, or near, rotation age. The productivity range applies to a fully-stocked or "normal" timber stand, and is expressed in gross merchantable cubic-foot volume down to a minimum diameter of four inches. The classification does not consider such things as forest management improvement practices, location, access, distance to markets, size of units, ownership or present state (condition).

In the Region of Peel, the land capability classification for forestry includes only five of the seven classes. For the purposes of this Report, the classification is further simplified into three groups: Group A - including Class 1 Capability; Group B - including Classes 2 and 3; and Group C - including Classes 4 and 5 (note Map 19).

Group A - Land having no important limitations to the growth of commercial forests

The predominant soil type is deep clay loam of shale and limestone origin. This soil type and others found in Group A are permeable, of medium texture, moderately well drained to imperfectly drained, naturally high in ferility, and of good water-holding capacity. The topography has gentle slopes, facilitating the transfer (through seepage) of moisture and nutrients from adjacent areas.

In the Region of Peel, more than 50% of the rural area in the City of Brampton, and about 1/3 of the area in the southern part of The Town of Caledon, are in this Group. The potential productivity of commercial timber is greater than 111 cubic feet per acre per year. The predominate species are White Spruce and Soft Maple.

Group B - Land having slight to moderate limitations to the growth of commercial forests

Soils vary from shallow to deep, from moderately to well drained, and from medium to fine textured. They have moderate to good water-holding capacities, and moderate to moderately low natural fertility for the growth of commercial timber.

In the Region of Peel, the Oak Ridges Moraine materials in the Town of Caledon and the clay tills near the Bolton and Malton areas are primarily in this Group. The soils include well-drained sandy loam with occasional pockets of gravel. The potential productivity ranges from 71 to 110 cubic feet per acre per annum. The primary species occurring in this Group are Red Pine, Hard Maple, Soft Maple and White Spruce.

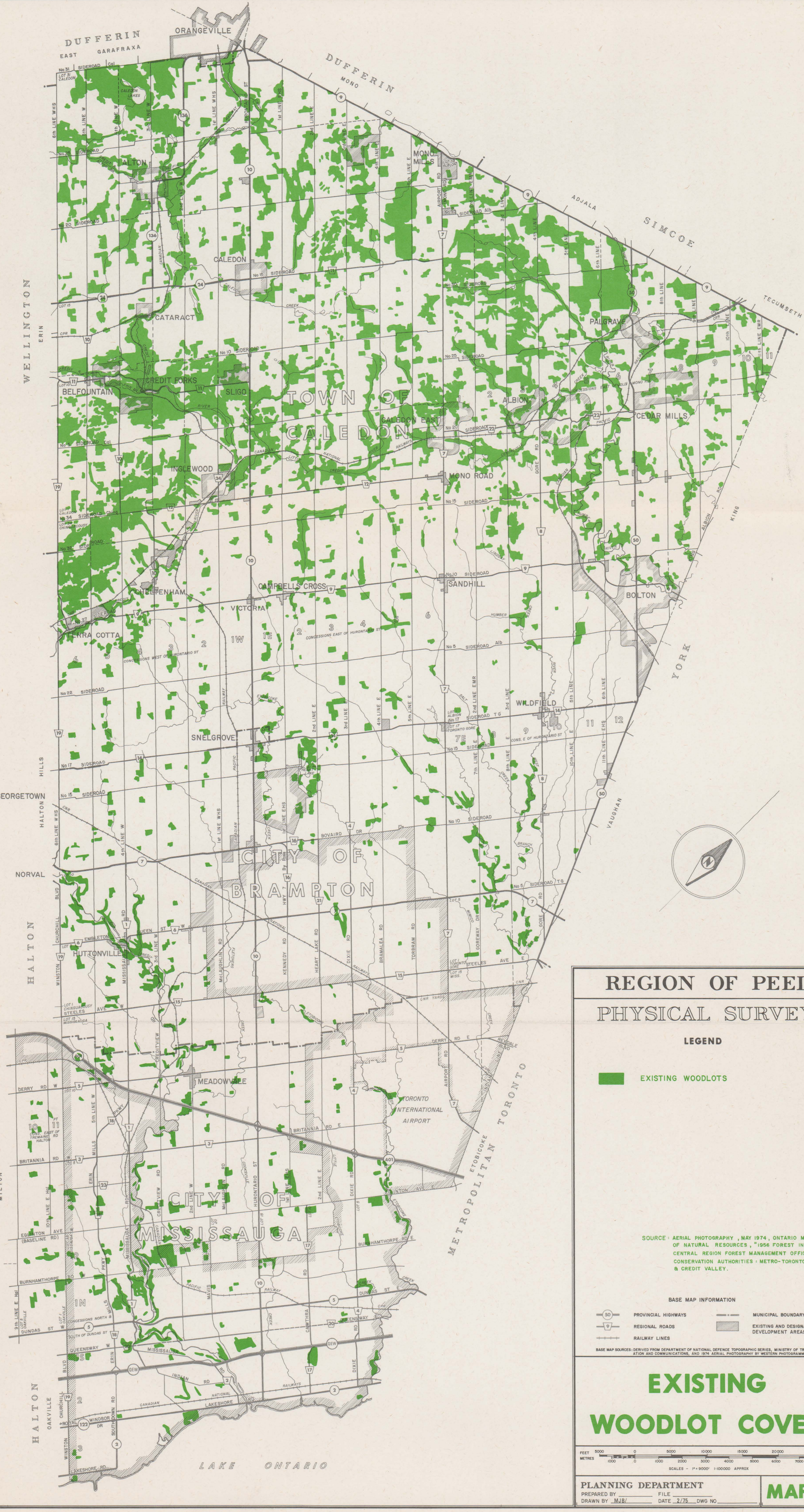
Group C - Land having moderately severe to severe limitations to the growth of commercial forests

Soils are frequently shallow over bedrock, stoney, excessively or poorly drained, coarse or fine textured. They have excessive or poor water-holding capacity and have low natural fertility. A very small area in the extreme northwestern portion of the Region, and a part of the Niagara Escarpment Planning Area near the boundary line between Peel and Halton, are in this Group. Both areas have shallow soils over bedrock. The potential productivity of commercial timber in this Group is usually low, in a range from 51 to 70 cubic feet per acre per annum. The common species include White Spruce, Red Pine, Soft Maple and Hard Maple.

REFERENCE NOTES

[1] D. W. Hoffman and N. R. Richards, Soil Survey of Peel County, Report No. 18 of the Ontario Soil Survey, Experimental Farm Service, Canada Department of Agriculture and the Ontario Agricultural College (November 1953), pp. 16-18.

[2] The Woodland Classifications were used to classify the types of timber stands in the 1957 Forest Resources Inventory (Ontario Department of Lands and Forests).



REGION OF PEEL

PHYSICAL SURVEY

LEGEND

🟩 EXISTING WOODLOTS

SOURCE : AERIAL PHOTOGRAPHY , MAY 1974 , ONTARIO MINISTRY
OF NATURAL RESOURCES , "1956 FOREST INVENTORY."
CENTRAL REGION FOREST MANAGEMENT OFFICE , JAN. 1975
CONSERVATION AUTHORITIES : METRO-TORONTO AND REGION
& CREDIT VALLEY.

BASE MAP INFORMATION

(50)	PROVINCIAL HIGHWAYS	—·—	MUNICIPAL BOUNDARY LINES
(9)	REGIONAL ROADS	▨	EXISTING AND DESIGNATED DEVELOPMENT AREAS
┼┼┼	RAILWAY LINES		

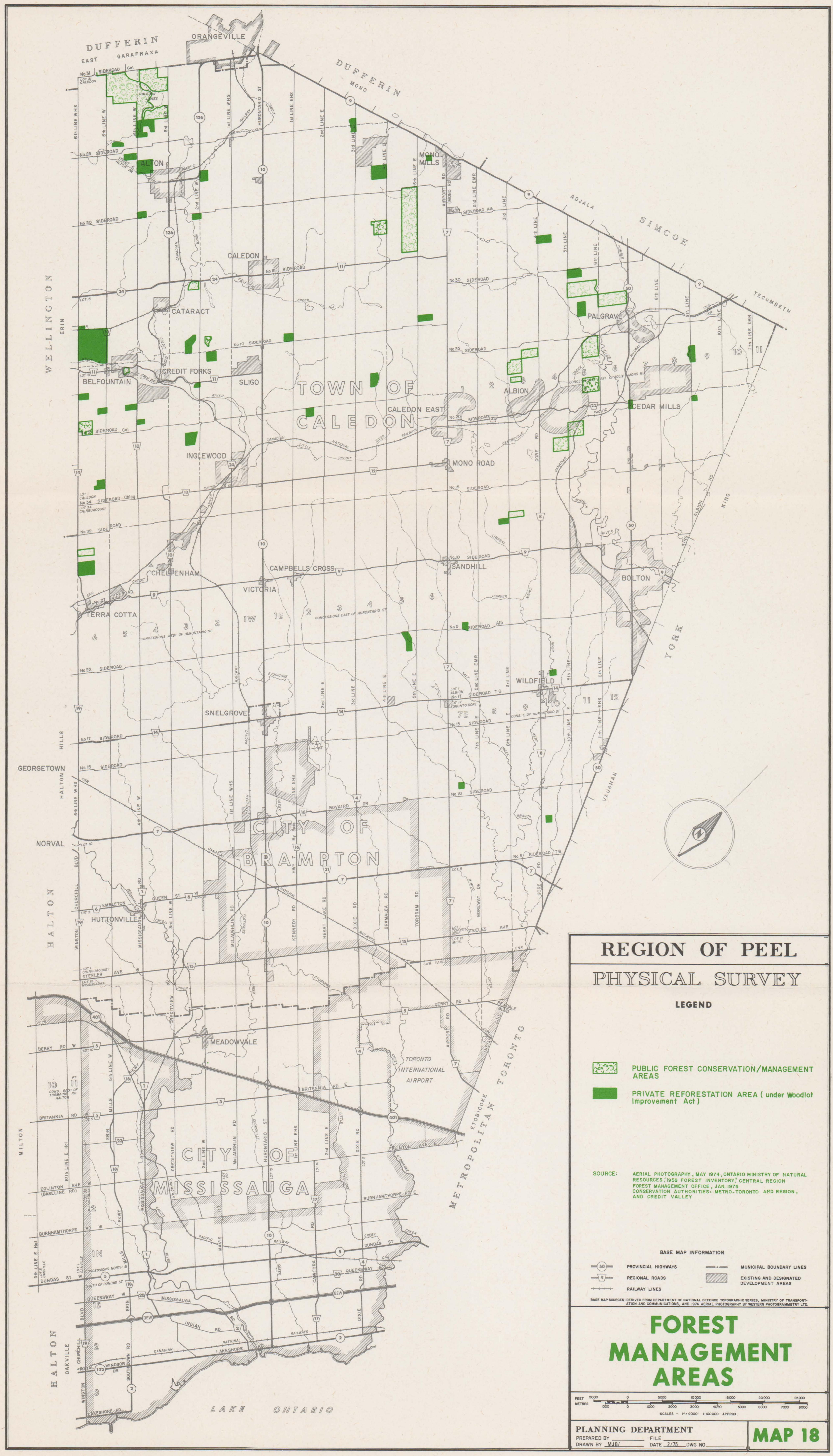
BASE MAP SOURCES: DERIVED FROM DEPARTMENT OF NATIONAL DEFENCE TOPOGRAPHIC SERIES, MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, AND 1974 AERIAL PHOTOGRAPHY BY WESTERN PHOTOGRAMMETRY LTD.

EXISTING WOODLOT COVER

FEET 5000 0 5000 10000 15000 20000 25000
METRES 1000 0 1000 2000 3000 4000 5000 6000 7000 8000
SCALES - 1" = 9000' 1:100000 APPROX

PLANNING DEPARTMENT
PREPARED BY ______ FILE ______
DRAWN BY MJB/ DATE 2/75 DWG NO ______

MAP 17



REGION OF PEEL

PHYSICAL SURVEY

LEGEND

- ▨ PUBLIC FOREST CONSERVATION/MANAGEMENT AREAS
- 🟩 PRIVATE REFORESTATION AREA (under Woodlot Improvement Act)

SOURCE: AERIAL PHOTOGRAPHY, MAY 1974, ONTARIO MINISTRY OF NATURAL RESOURCES,"1956 FOREST INVENTORY." CENTRAL REGION FOREST MANAGEMENT OFFICE, JAN. 1975
CONSERVATION AUTHORITIES: METRO-TORONTO AND REGION, AND CREDIT VALLEY

BASE MAP INFORMATION

(50)	PROVINCIAL HIGHWAYS	—•—	MUNICIPAL BOUNDARY LINES
(9)	REGIONAL ROADS	▨	EXISTING AND DESIGNATED DEVELOPMENT AREAS
+++	RAILWAY LINES		

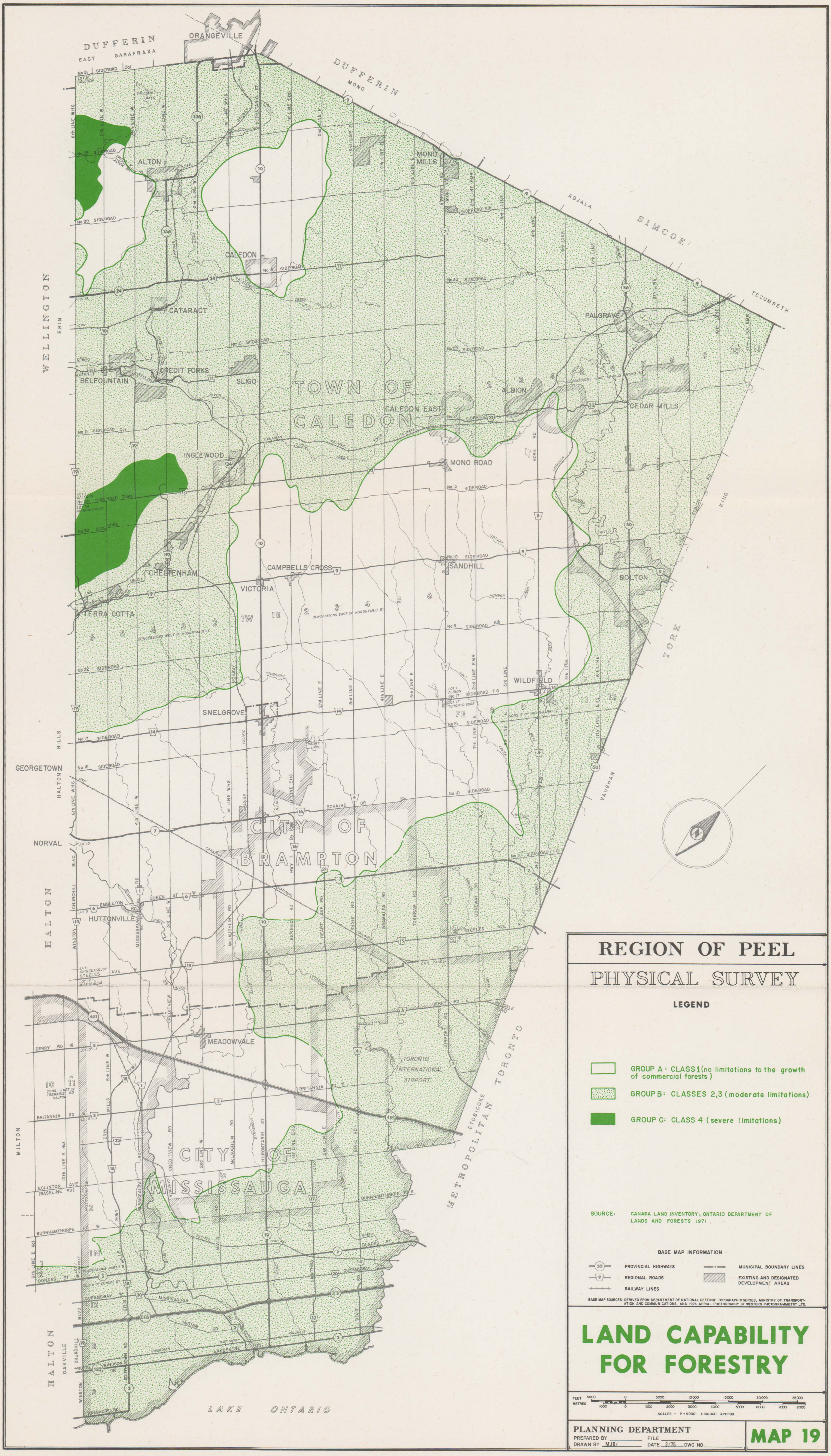
BASE MAP SOURCES: DERIVED FROM DEPARTMENT OF NATIONAL DEFENCE TOPOGRAPHIC SERIES, MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, AND 1974 AERIAL PHOTOGRAPHY BY WESTERN PHOTOGRAMMETRY LTD.

FOREST MANAGEMENT AREAS

FEET 5000 0 5000 10000 15000 20000 25000
METRES 1000 0 1000 2000 3000 4000 5000 6000 7000 8000
SCALES - 1" = 9000' 1:100000 APPROX

PLANNING DEPARTMENT
PREPARED BY ____________ FILE ____________
DRAWN BY MJB/ DATE 2/75 DWG NO ____________

MAP 18



REGION OF PEEL

PHYSICAL SURVEY

LEGEND

☐	GROUP A : CLASS 1 (no limitations to the growth of commercial forests)
▨	GROUP B : CLASSES 2,3 (moderate limitations)
🟩	GROUP C : CLASS 4 (severe limitations)

SOURCE: CANADA LAND INVENTORY; ONTARIO DEPARTMENT OF LANDS AND FORESTS 1971

BASE MAP INFORMATION

50	PROVINCIAL HIGHWAYS	— • —	MUNICIPAL BOUNDARY LINES
9	REGIONAL ROADS	▨	EXISTING AND DESIGNATED DEVELOPMENT AREAS
+++	RAILWAY LINES		

BASE MAP SOURCES: DERIVED FROM DEPARTMENT OF NATIONAL DEFENCE TOPOGRAPHIC SERIES, MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, AND 1974 AERIAL PHOTOGRAPHY BY WESTERN PHOTOGRAMMETRY LTD.

LAND CAPABILITY FOR FORESTRY

FEET 5000 0 5000 10000 15000 20000 25000
METRES 1000 0 1000 2000 3000 4000 5000 6000 7000 8000
SCALES - 1" = 9000' 1:100000 APPROX

PLANNING DEPARTMENT
PREPARED BY ______ FILE ______
DRAWN BY MJB/ DATE 2/75 DWG NO ______

MAP 19

CHAPTER XIII

EXISTING OPEN SPACE AND RECREATION

Definition

Open space has different meanings to different people, and may vary in size, function, form, spatial scale and distribution. For the purposes of this Report, open space is defined as an area of predominantly open land, which may be in a natural state or in a man-made landscaped form. The quantity, spatial distribution, function and scale of open space affect the character and quality of the urban and rural environment.

Open space may serve the following functions:

1) Enhancement and provision of recreational opportunities for the urban population.

2) Conservation of soil, water, wetlands, marshes, forests, beaches, and other natural resources.

3) Flood control; protection and management of water resources, rivers and streams, fisheries and wildlife.

4) Preservation of natural amenities, distinctive natural features and historical sites.

5) Assistance in structuring urban form and guiding the direction and timing of urban development.

Open space has become more significant in recent times as a result of two conflicting demand trends:

1) the consumption of thousands of acres of rural land for urban growth and development; and

2) the increasing demand for outdoor recreation as a consequence of population growth, increase in leisure time, increase in family income and a higher standard of living generally.

These trends are bringing about a significant change in the demand patterns and preferences for recreational facilities.

This Report surveys existing open space areas in Peel in order to facilitate both an analysis of open space supply and demand, and an identification of open space recreational problems of Regional significance;

all this eventually leading to a Regional open space policy.

The open space and parklands included in this survey consist of a Provincial Park, conservation areas, and a few municipal parklands which function as Regional open space due to their size, location, site characteristics and the availability of recreational facilities.

Functional Classifications[1]

Regional parkland may be defined as a large area of open space, in either a natural state or man-made form, which is generally available for diversified year-round use by a large segment of the population. It may include conservation areas, wildlife sanctuaries, Provincial parks, stream valley green belt systems, game reserves, scenic drives, waterfront areas, golf courses, botanical gardens, trail systems, fairgrounds, race tracks, parks and beaches. Characteristically, regional parkland is readily accessible to the public within a 60-minute travel distance, and is preferably served by public transit. Regional parkland is usually of significance to more than one municipality regardless of which municipality owns it.

Existing Open Space Recreation Areas

The following areas have been included in this survey of open space in the Region of Peel: the Forks of the Credit (a Provincial Park), all Conservation Areas owned by the Metropolitan Toronto and Region Conservation Authority and by the Credit Valley Conservation Authority; and a few municipal parks of more than 100 acres in size, which are accessible by way of the Regional Roads System (and which are categorized as Regional Parks and Open Space on Map 20). Proposed facilities or land acquisitions for future development are not included in this survey. Within the Region of Peel, most of the existing open space system is under the jurisdiction of the Metropolitan Toronto and Region Conservation Authority and the Credit Valley Conservation Authority in the Humber River, the Etobicoke Creek and the Credit River Watersheds.

Table 14 and Map 20 show the existing open space and recreational areas in the Region of Peel according to land ownership, acreage and facilities provided.

The Role of the Conservation Authorities in the Provision of Open Space and Recreation

Under the terms of The Conservation Authorities Act, Sections 19 and 20, the Conservation Authorities are permitted to establish and undertake programmes for the conservation, restoration, development and management of natural resources, other than gas, oil and minerals, in watersheds over which they have jurisdiction.

The major functions of the Authorities include:

1) Water management and flood and erosion control in designated watershed areas;
2) The provision of recreational facilities in Conservation Areas owned and controlled by the Authorities;
3) The conservation and management of forest and wildlife areas; and
4) The preservation of unique natural features and historical landmarks.

The Authorities have made significant contributions to the open space system and recreational facilities in the Region of Peel. In most cases, Conservation Areas encompass large tracts of valley lands with unique topographical features. Every effort has been made by the Authorities to keep the natural landscape character in the Conservation Areas. Recreational facilities and activities which are compatible with this natural landscape are provided, including picnicking, swimming, camping, boating, fishing, hiking and winter sports activities.

In addition to recreation, Conservation Areas may be utilized for flood control, the preservation of wetlands and marshes, reforestation, nature studies, and public education programmes (the teaching of sound conservation practices).

A Conservation Authority, under the terms of an agreement with

Table 14

EXISTING OPEN SPACE AND RECREATION
REGION OF PEEL, 1975

Ownership	Site Location	Land Acreage	Picnicing	Swimming	Fishing	Boating	Camping	Skiing (down hill or across country)	Skating	Snow mobile	Hiking (trails, riding)	Natural Studies	Historical Site	Play Field (for active sports)	Refreshment	Wildlife and Forest Management	Bike Trail	Botanical Garden
The Province of Ontario	Forks of Credit	507.0	(Provincial Park Reserve)															
Metro-Toronto and Region Conservation Authority	Glen Haffy C.A.	752.9	x		x						x	x			x	x		
	Palgrave C.A.	565.0	x		x						x	x				x		
	Albion Hill C.A.	991.0	x	x			x	x	x	x	x	x			x	x		
	Bolton C.A.	1,509.0	x	x											x			
	Clairville C.A.	1,554.0	x	x		x	x	x	x	x	x				x			
	Heart Lake C.A.	374.6	x	x	x	x	x		x	x	x				x			
	Niagara Escarpment Land[1]	146.0																
	Snelgrove C.A.	113.0																
	Humber Forest[6]	1,733.0																
	Sub Total	7,738.5[7]																
Credit Valley Conservation Authority	Caledon Lake C.A.	458.0	x				x									x		
	Belfountain C.A.	30.0	x	x	x						x							
	Erindale C.A.	132.0	x								x							
	Meadowvale C.A.	120.5	x	x	x						x				x			
	Meadowvale Botanical Garden[2]	104.0																
	Fletcher Cr. C.A.[3]	6.0																
	Mains Cr. C.A.[3]	10.0																
	Melville Church	1.1																
	Cooksville Cr. C.A.[3]	5.0																
	Miss. Valley Land[4]	5.4																
	Milkwood Property[4]	44.5																
	Streetsville C.A.[4]	33.0																
	Terra Cotta C.A.[5]	51.0																
	Rattray Marsh	25.0																
	Lakeside Park[4]	25.0																
	B.N.R. Property	5.6																
	Forest C.A.[6]	260.0																
	Sub Total	1,316.1																
Municipal Parkland	Jack Darling Memorial Park	100.0	x			x								x	x			
	Chinguacousy Park	100.0	x		x	x		x	x					x	x		x	x
GRAND TOTAL		9,761.6																

Sources = Annual report of the Metro-Toronto and Region Conservation Authority and the Credit Valley Conservation Authority.

Information Package, the Region of Peel Conservation Areas, prepared by Regional Recreation Planner, the Ontario Ministry of Natural Resources, October, 1974.

Notes =
1) Land undeveloped and owned by the M.T.R.C.A.
2) Land acquired for future development.
3) Properties acquired for channel improvement.
4) Land sub-leasing to local municipalities.
5) The total acreage in Terra Cotta Conservation Area is 359 acres.
6) The forest management areas are not open to the public.
7) A total of 1,403.7 acres of reforestation areas are managed by the Ministry of Natural Resources, Forest Management Branch.

a municipality, may lease Authority lands to the municipality for park purposes.

At present, the Metopolitan Toronto and Region Conservation Authority has acquired a total of 7,739 acres of land in the Region of Peel for open space and recreational uses. Of this, about 1,879 acres of land are devoted to reforestation in the Humber Forest (not open to the public); and a total of 5,860 acres of land are used for recreational purposes. The Credit Valley Conservation Authority provides a total of 1,316 acres of open space in Peel. Of this, 311 acres are used for forest management (not open to the public), and about 1,005 acres are available for recreational uses. The Province of Ontario owns a total of 507 acres of park reserve at the Forks of the Credit.

Land Capability for Recreation

The Canada Land Inventory (Canada Department of Regional Economic Expansion) is the principal source used in the preparation of Map 21 on Land Capability for Recreation in the Region of Peel.

Land capability for recreation is divided into seven classes on the basis of the intensity, quality and quantity of recreation areas, regardless of present accessibility and location relative to population centres. The classification is also based on the following factors:

1) The Inventory is of a reconnaissance nature using aerial photographic interpretation and field checks to assess the quality, quantity and distribution of recreational resources on a nation-wide basis.

2) The classification is ranked in accordance with the natural capability under existing conditions.

3) Sound recreational development practice and management are assumed for all areas in regard to the natural capability of each area.

4) The class ranking of a given area is also based on the presence of wildlife and sport fish without indicating their biological productivity.

In the Region of Peel, Land Capability for Recreation is comprised of Classes 2 to 7, which are further simplified into three groups: Group A - including Classes 2 and 3; Group B - including Classes 4 and 5; and Group C - including Classes 6 and 7.

Group A - Land having a moderate to high capability: Lands in Group A have a high natural capability to generate and sustain a moderate to high intensive recreational use per unit area per annum.

In the Region of Peel, Group A Classification applies in an area near the Forks of the Credit where the Niagara Escarpment traverses the northwestern part of the Region. In this area, the predominate physiographic feature is the Credit River Valley, which is bordered on both sides by the Niagara Escarpment bluffs. At Cataract, there is a spectacular waterfall topped by an old ruined powerhouse and dam. In the vicinity of the Forks, the face of the Escarpment is heavily wooded with a variety of tree species. The Bruce Trail runs through the area and takes in the scenic vistas from the top of the Escarpment. The Dominion Road, hugging the Credit River from the Forks to Cataract, has been claimed to be the most scenic spot in the whole Region of Peel. In the vicinity of the Forks of the Credit, there is a great variety of bird species for bird watching and nature study. The Credit River is widely known for its Brown and Brook Trout fishing, although the Brown Trout fishing has declined in recent years.

In general, from Belfountain to Cataract, the lands in the vicinity of the Escarpment and the Forks present the most prominent natural features in Peel, and have a high capability for recreation.

Group B - Land having moderate to moderately low capability for recreation; Land in Group B have a moderate to moderately low capability to sustain extensive recreational activities.

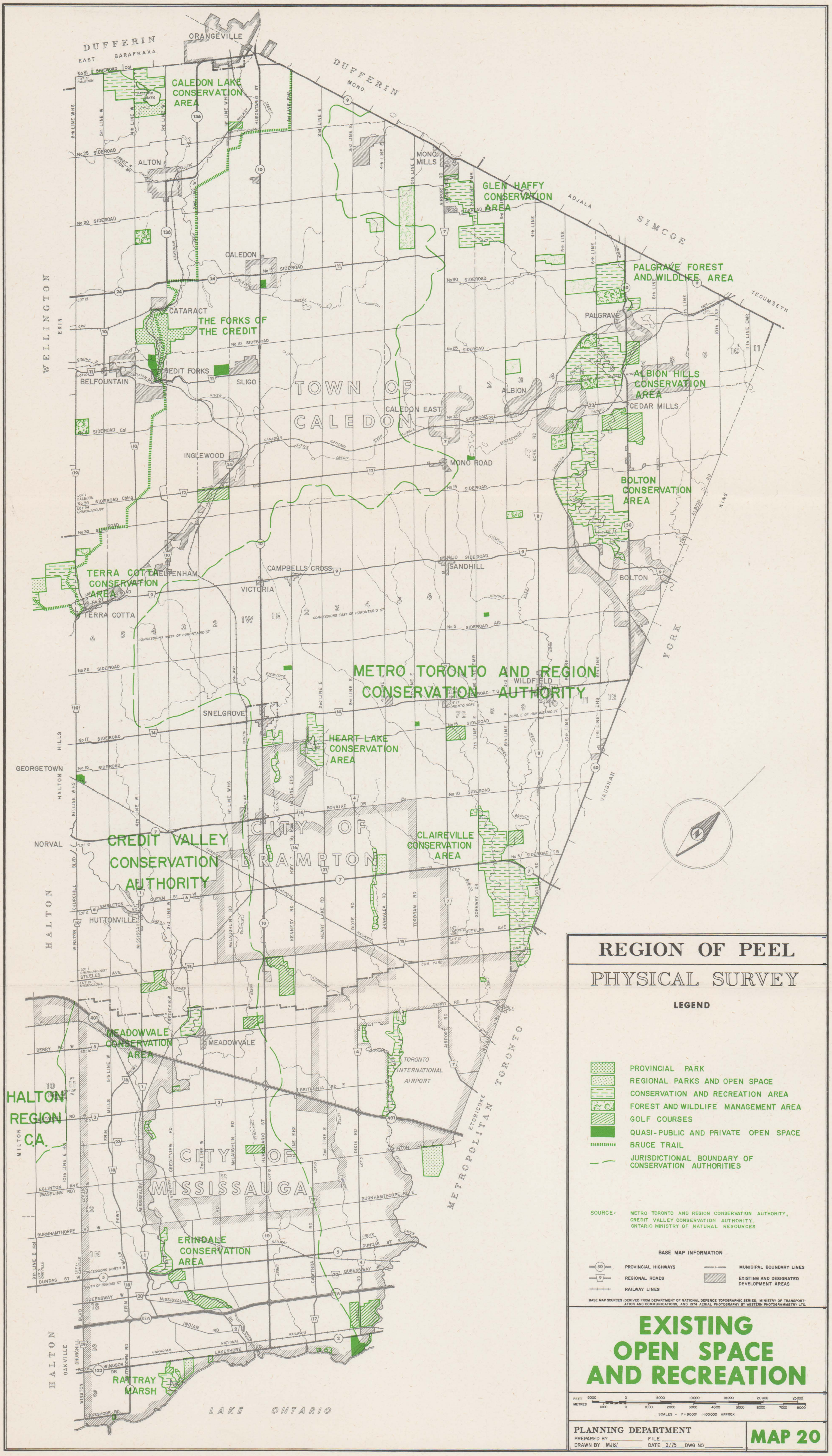
In the Region of Peel, lands with Group B Classification consist of those located in the Oak Ridges Moraine Complex (in the Town of Caledon) as well as the Caledon Lake Conservation Area. With irregular or gentle slopes, the upstream areas offer a great potential for wildlife and sport fishing. The marshes at the source of Shaw's Creek, the valley land near Alton (where two branches of the Credit River meet), the swampy areas up-stream of Cold Creek, and the Humber River and its tributaries, are all extremely fragile environments and contain flora and fauna not found elsewhere in the Central Ontario Region. In addition, the Valley land of the Credit River in Mississauga, and the green belt of the West Branch of the Humber River near the Claireville Conservation Area, are in the Group B capability classification.

Group C - Land having a very low capability for recreation: Lands in Group C have the natural capability to sustain only a very low intensity of recreational activity.

Lands consisting of imperfectly drained clay loam on relatively flat areas are in the Group C classification. These lands have little variation in natural topography and few, if any, prominent features.

REFERENCE NOTE

[1] Standards for Recreational Facilities, Ontario Ministry of Social and Community Services, 1973.



REGION OF PEEL

PHYSICAL SURVEY

LEGEND

- ▨ PROVINCIAL PARK
- ▨ REGIONAL PARKS AND OPEN SPACE
- ▤ CONSERVATION AND RECREATION AREA
- ▨ FOREST AND WILDLIFE MANAGEMENT AREA
- ▨ GOLF COURSES
- ■ QUASI-PUBLIC AND PRIVATE OPEN SPACE
- BRUCE TRAIL
- JURISDICTIONAL BOUNDARY OF CONSERVATION AUTHORITIES

SOURCE: METRO TORONTO AND REGION CONSERVATION AUTHORITY,
CREDIT VALLEY CONSERVATION AUTHORITY,
ONTARIO MINISTRY OF NATURAL RESOURCES

BASE MAP INFORMATION

- PROVINCIAL HIGHWAYS
- REGIONAL ROADS
- RAILWAY LINES
- MUNICIPAL BOUNDARY LINES
- ▨ EXISTING AND DESIGNATED DEVELOPMENT AREAS

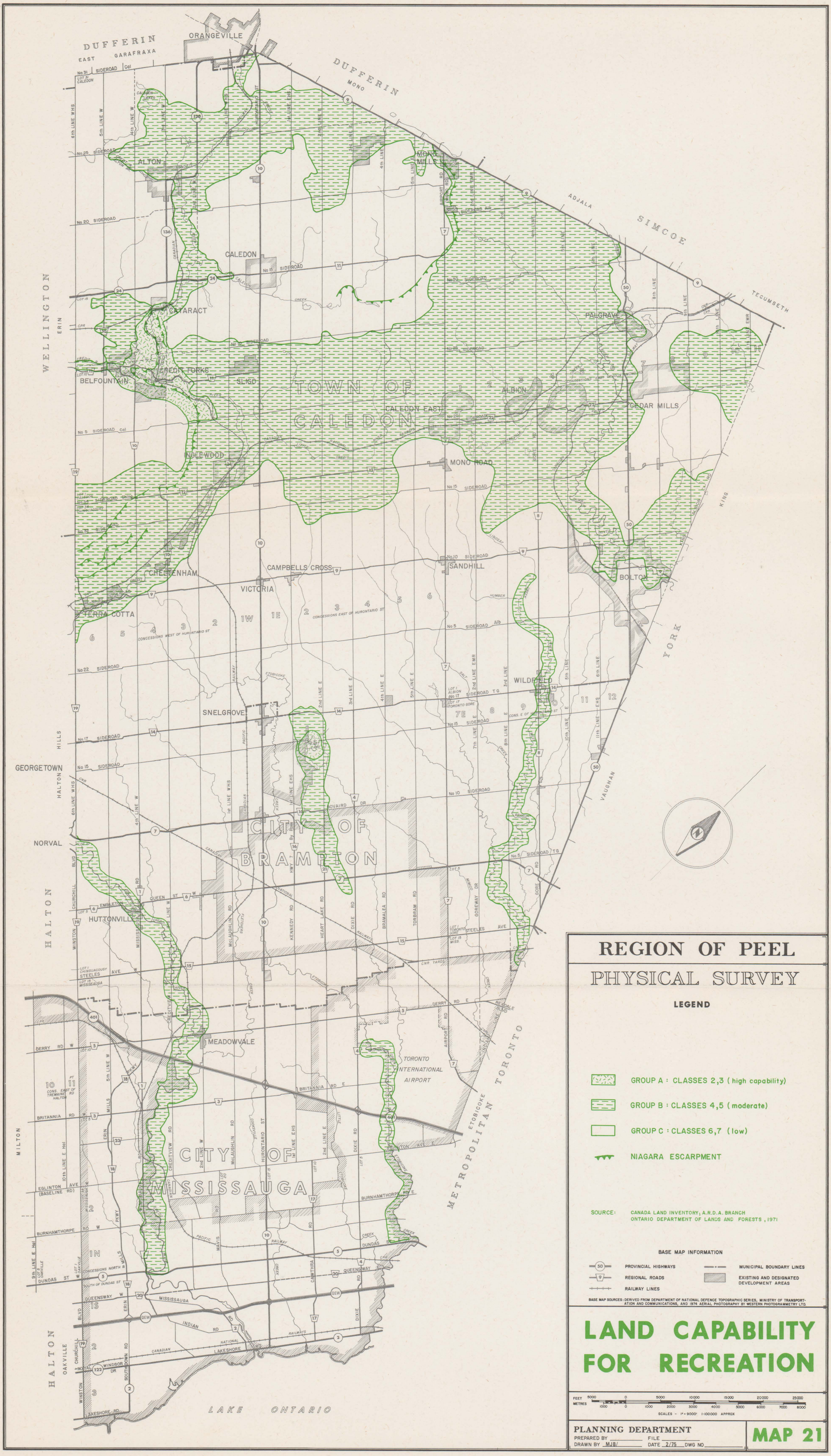
BASE MAP SOURCES: DERIVED FROM DEPARTMENT OF NATIONAL DEFENCE TOPOGRAPHIC SERIES, MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, AND 1974 AERIAL PHOTOGRAPHY BY WESTERN PHOTOGRAMMETRY LTD.

EXISTING OPEN SPACE AND RECREATION

FEET 5000 0 5000 10000 15000 20000 25000
METRES 1000 0 1000 2000 3000 4000 5000 6000 7000 8000
SCALES - 1" = 9000' 1:100000 APPROX

PLANNING DEPARTMENT
PREPARED BY ________ FILE ________
DRAWN BY MJB/ DATE 2/75 DWG NO ________

MAP 20



REGION OF PEEL

PHYSICAL SURVEY

LEGEND

▨ GROUP A : CLASSES 2,3 (high capability)

▤ GROUP B : CLASSES 4,5 (moderate)

☐ GROUP C : CLASSES 6,7 (low)

NIAGARA ESCARPMENT

SOURCE: CANADA LAND INVENTORY; A.R.D.A. BRANCH
ONTARIO DEPARTMENT OF LANDS AND FORESTS , 1971

BASE MAP INFORMATION

PROVINCIAL HIGHWAYS
REGIONAL ROADS
RAILWAY LINES
MUNICIPAL BOUNDARY LINES
▨ EXISTING AND DESIGNATED DEVELOPMENT AREAS

BASE MAP SOURCES: DERIVED FROM DEPARTMENT OF NATIONAL DEFENCE TOPOGRAPHIC SERIES, MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, AND 1974 AERIAL PHOTOGRAPHY BY WESTERN PHOTOGRAMMETRY LTD.

LAND CAPABILITY FOR RECREATION

FEET 5000 0 5000 10000 15000 20000 25000
METRES 1000 0 1000 2000 3000 4000 5000 6000 7000 8000
SCALES - 1" = 9000' 1:100000 APPROX

PLANNING DEPARTMENT
PREPARED BY ________ FILE ________
DRAWN BY MJB/ DATE 2/75 DWG NO ________

MAP 21

CHAPTER XIV

WILDLIFE AND FISHERIES

The continuing urbanization of land in Central Ontario (including the Region of Peel) will have a considerably negative impact upon the few remaining unpolluted rivers and primitive areas with potential for fish and wildlife preserves. The process of urban growth will place greater strain on already scarce forest, wildlife and fishery resources. In order to meet our present and future needs to provide opportunities to enrich and expand outdoor knowledge and recreational experiences in natural conditions, a concerted effort by the public in general, and by government agencies in particular, will be required to effect the conservation and wise use of irreplaceable resources.

Efforts directed toward the conservation and wise use of these irreplaceable natural resources should be guided by the following two objectives:

1) The preservation of unique water and land areas having a high capability to sustain fish and wildlife for recreation, conservational education and scientific study.

2) The encouragement of necessary changes or modifications in current land use, particularly in farming operations in the vicinity of fish and wildlife areas, in order to minimize detrimental effects on fish and wildlife habitats.

Unique Water and Land Areas for Sport Fishing and Wildlife in the Region of Peel

In the Region of Peel, there are few remaining areas of water and land particularly suitable for sport fish and wildlife preservation. The areas which do remain include the following:

1) Credit River Watershed:

   a) The upper reaches from the Forks of the Credit to Caledon Lake Conservation Area and the Orangeville Reservoir Conservation Area (the primary location).
   b) The middle reaches from the Forks of the Credit to Norval.
   c) The lower stretch of the Credit from Norval to Port Credit.

2) The headwater source areas of the Humber River and its tributaries.

3) The Lake Ontario waterfront area.

Credit River Watershed

Throughout the entire Credit River Watershed, with forest cover of various species and relatively unpolluted water, particularly in the upper reaches of the River, the natural conditions are excellent for sport fish and wildlife preservation.

The Report on Fish Management in the Credit River Watershed, by Wainio, Price and Hester (Ministry of Natural Resources, 1972), provides an in-depth survey and analysis of fish populations. The purpose of the study, which resulted in this Report, was to obtain an overall picture of the various fish species in order to determine the techniques and programmes needed to improve fish management. Table 15 shows the fish species found in the various sections of the Credit River from a sampling survey undertaken in 1971.

Between 1923 and 1971, various fish species were stocked in the Credit River by the Department of Lands and Forests (now the Ministry of Natural Resources). These species include the Chinook and Coho Salmon, the Eastern Brook Trout, the Rainbow and the Brown Trout, and the Smallmouth and Largemouth Bass. At present, only the Eastern Brook Trout is being stocked in the Credit River on a regular basis. The stocking of Brown Trout was discontinued in 1961, and the population of this fish species in the Credit River has declined since then.

The general fishing opportunities in the Credit River can be divided into three sections:

a) The Upper Reaches (Forks of the Credit to Caledon Lake)

Table 15

Distribution of Fish Species Along the Main Credit River (1971 Sampling Survey)

UPPER SECTION: from the Forks of the Credit to the Upper Reaches of the River	MIDDLE SECTION: from the Forks to Norval	LOWER SECTION: from Norval to Port Credit
White Sucker	White Sucker	White Sucker
Blacknose Shiner	Blacknose Shiner	Blacknose Shiner
Blacknose Dace	Blacknose Dace	Blacknose Dace
Longnose Dace	Longnose Dace	Longnose Dace
Johnny Darter	Johnny Darter	Johnny Darter
Iowa Darter	Iowa Darter	-
Mottled Sculpin	Mottled Sculpin	-
Fathead Minnow	-	Fathead Minnow
-	Creek Chub	Creek Chub
-	Bluntnose Minnow	Bluntnose Minnow
-	Common Shiner	Common Shiner
-	Stonecat	Stonecat
-	Rock Bass	Rock Bass
-	Pumpkinseed	Pumpkinseed
-	Rainbow Darter	Rainbow Darter
-	Hog Sucker	Carp
Brook Trout	-	Hornyhead Chub
Central Mudminnow	-	-
Redbelly Dace	-	-
Finescale Dace	-	-
5-Spine Stickleback	-	-
-	Fantail Darter	Brow Bullhead

Source: A. A. Wainio, D. H. Price, R. A. Hester, Fish Management in the Credit River Watershed, Ministry of Natural Resources (May, 1972), page 72.

Brook Trout, White Suckers, Longnose Elace and Brook Sticklebacks are the species most commonly found in this section of the River, where the water quality is excellent. The stocking of Brown Trout could be reinstated to improve fishing opportunities. Table 16 shows the fish species from sampling surveys conducted in 1965 and 1971.

b) The Middle Reaches (Forks of the Credit to Norval)

The common fish species found in this section of the Credit include the Bluntnose Minnow, Creek Chub, Shiner, Rock Bass, Rainbow Darters, and Longnose and Blacknose Dace. There is a great amount of pondweed present in this section of the River, and the water is relatively murky and polluted.

The common wildlife species include the White Tailed Deer and various upland game species, which are found in the Watershed from Inglewood to Terra Cotta.

The natural conditions for wildlife and fish propagation in this section of the Watershed are generally excellent.

c) The Lower Stretch (Norval to Port Credit)

The common fish species found in this stretch of the River are Catfish, Sunfish, Green Bass, Carp, Brown Bullhead and Hornyhead Chub. The quantity and quality of fish species are marginal for fishing opportunities. In the lower stretch of the River, large-scale land clearing for intensive farming, industrial and residential development has left the River Valley particularly vulnerable to erosion and unshaded from sunlight. The water is murky, its temperature may fluctuate by several degrees in midday and its quality is deteriorated.

In spite of the poor water quality for fish life, this section of the River, which includes the Meadowvale and Erindale Conservation Areas, contains a great variety of plant and bird species. There is an extremely good bird colony in the Erindale

Table 16

Comparison of Fish Species Found in 1965 and 1971 Sampling Surveys in the Upper Reaches of the Credit River

Types of Species	Sampling Survey In 1965 by O.W.R.C.	Sampling Survey In 1971 By Lands and Forests
Brown Trout		X
Eastern Brook Trout	X	X
Central Mudminnow	X	X
White Sucker	X	X
Pearl Dace	X	X
Redbelly Dace	X	X
Fathead Minnow	X	X
Blacknose Shiner	X	X
Blacknose Dace	X	X
Longnose Dace	X	X
Brook Stickleback	X	X
Rainbow Darter	X	
Iowa Darter		X
Mottled Sculpin	X	
Creek Chub	X	X

Source: A. A. Wainio, D. H. Price, R. A. Hester, Fish Management in the Credit River Watershed, Ministry of Natural Resources (May, 1972), page 49.

Ravine. Red Tail Owls, Horned Owls, Long Eared Owls, Pileated Woodpeckers, Indigo Buntings, Downings and Hairy Meadowlarks are species commonly found in this Ravine area.

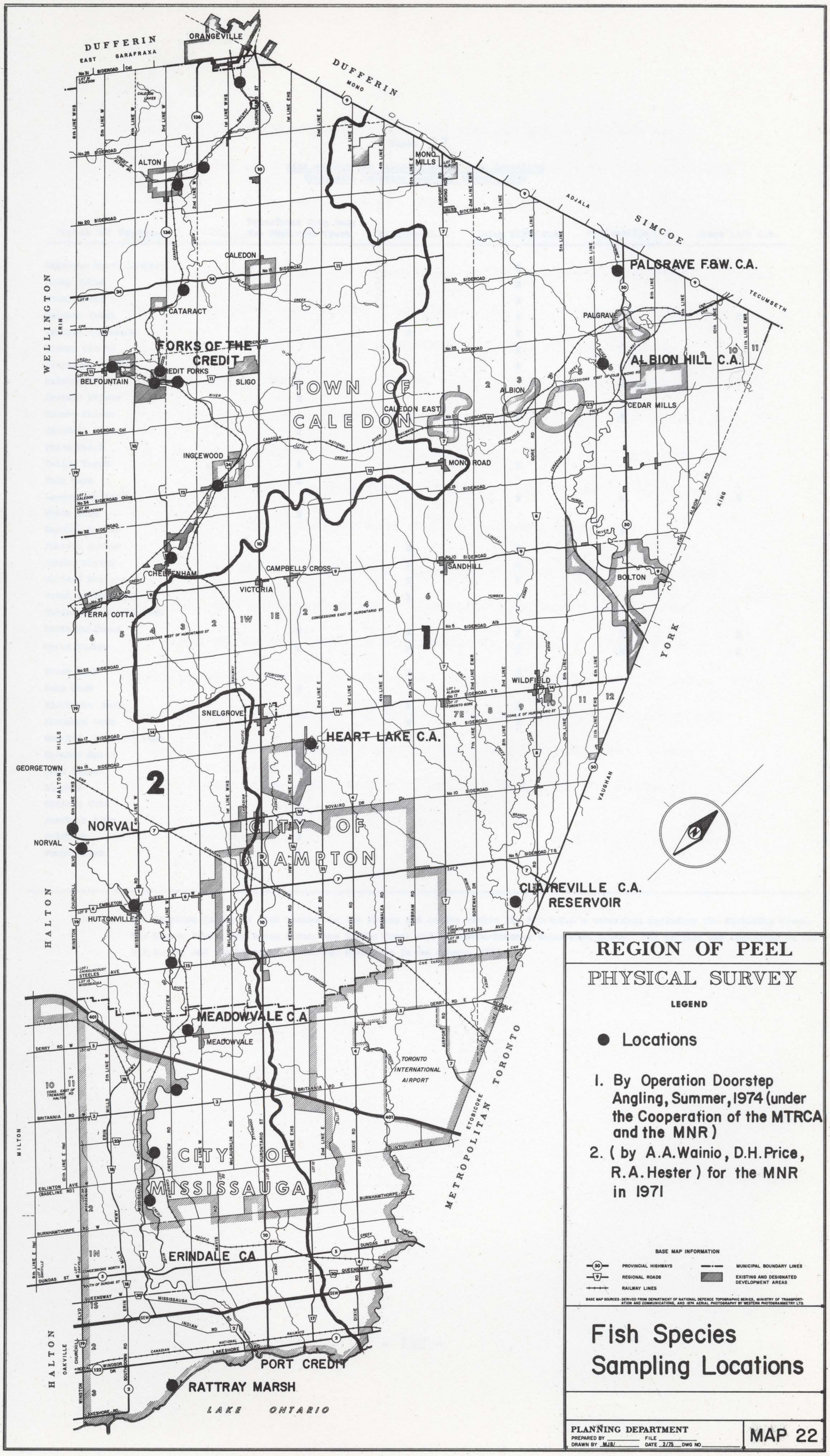
Humber River Watershed (and Etobicoke Creek)

There are various outstanding locations for sport fish and wildlife conservation within the jurisdiction of the Metropolitan Toronto and Region Conservation Authority. In the summer of 1974, co-operative efforts were made between the Ministry of Natural Resources and the Authority to undertake a sampling survey of fish species by Operation Doorstep Angling in the Etobicoke Creek, the Humber River and its tributaries, the Rouge River, the Duffin Creek and the waterfront areas. There were eight sites selected for sampling along the shoreline of Lake Ontario and sixteen sites along the aforementioned rivers and creeks. Map 22 reveals the sites within the Region of Peel, which were included in this sampling survey. These sites are: Palgrave Wildlife and Fish Conservation Area, Albion Hills Conservation Area, Claireville and Heart Lake Conservation Areas and the mouth of the Etobicoke Creek (at Lake Ontario). The common fish species found in the survey are listed in Table 17.

The wildlife species commonly found in the upper reaches of the Humber River Watershed, particularly in the Palgrave area, include: a variety of ducks, other waterfowl, mammals, reptiles and amphibians; White Tailed Deer, rabbits, grouse and woodcocks.

Lake Ontario Waterfront

Within the Credit River Watershed, the Credit Valley Conservation Authority has acquired two properties along the waterfront for conservation purposes: Lakeside Park and Rattray Marsh. The Conservation Authority has approved a Master Plan for the long-range development of the Mississauga sector of the Lake Ontario waterfront, and has embarked upon a land acquisition program.



REGION OF PEEL

PHYSICAL SURVEY

LEGEND

● Locations

1. By Operation Doorstep Angling, Summer, 1974 (under the Cooperation of the MTRCA and the MNR)
2. (by A.A.Wainio, D.H.Price, R.A.Hester) for the MNR in 1971

BASE MAP INFORMATION

—(50)—	PROVINCIAL HIGHWAYS	—·—	MUNICIPAL BOUNDARY LINES
—▽9—	REGIONAL ROADS	▨	EXISTING AND DESIGNATED DEVELOPMENT AREAS
+++++	RAILWAY LINES		

BASE MAP SOURCES: DERIVED FROM DEPARTMENT OF NATIONAL DEFENCE TOPOGRAPHIC SERIES, MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, AND 1974 AERIAL PHOTOGRAPHY BY WESTERN PHOTOGRAMMETRY LTD.

Fish Species Sampling Locations

PLANNING DEPARTMENT
PREPARED BY ________ FILE ________
DRAWN BY MJB/ DATE 2/75 DWG NO ________

MAP 22

Table 17

Fish Species and Sampling Survey Site Locations
(Operation Doorstep Angling, Summer 1974)

Types of Species	Waterfront Site Near The Etobicoke Creek	Palgrave C.A.	Albion Hills C.A.	Claireville C.A.	Heart Lake C.A.
American Brook Lamprey			X		
Brown Trout			X		
Brook Trout			X		
Rainbow Trout			X		X
Central Mudminnow		X	X		
Brassy Minnow			X		
Bluntnose Minnow	X		X	X	X
Fathead Minnow	X			X	X
Emerald Shiner	X				
Common Shiner		X	X	X	
Spottail Shiner	X				
White Perch	X				
Yellow Perch	X		X		
Rock Bass	X				
Largemouth Bass			X	X	X
White Bass	X				
Rainbow Darter				X	
Fantail Darter		X	X		
Johnny Darter		X	X		
Mottled Sculpin		X	X		
Brook Stickleback		X	X		
Threespine Stickleback	X				
Brown Bullhead	X	X	X	X	X
White Sucker	X	X	X	X	X
Creek Chub		X	X		
Lake Chub	X				
Blacknose Dace		X	X		
Longnose Dace		X	X		
Northern Redbelly Dace		X			
Rainbow Smelt	X				
Coho Salmon	X				
Alewife	X				
Gizzard Shad	X				
Northern Pike	X				
Goldfish	X				
Pumpkinseed	X				

Source: The Sampling Survey of fish species in the rivers and creeks within the M.T.R.C.A's watershed including the Etobicoke Creek, the Humber River, the Rouge River, the Duffin Creek and the Metro-Toronto Waterfront areas. The project was sponsored by the M.T.R.C.A. and the Ministry of Natural Resources in the summer, 1974.

The Rattray Marsh, with its various plant species and a diversity of wildlife habitats, is a unique remnant of the primitive landscape in Southern Ontario. The site is gently rolling with densely wooded hills. Surrounding the open water, there are three concentric bands of vegetation, which consist of a cattail marsh, an upland meadow and a woodland. Approximately 420 species of plants were found in the geobotanical study of the Rattray Marsh by Ian D. MacDonald of Queen's University.[1] The commonly found species include Green Ash and Hemlock-Birch wet vegetation, and Beech-Birch-Hemlock-Maple combinations. Table 18 shows the plant species found in the Marsh, which are not commonly found elsewhere in the Region of Peel and in Southern Ontario.

The Marsh provides an excellent nesting yard for breeding waterfowl and migratory birds. About 100 species of song birds, ducks and geese are found in the area. In addition, there is a significant population of pheasant, grouse, rabbits, mice, voles, muskrats and raccoons in the Marsh. The various Hawk species shown in Table 18 were documented by the South Peel Naturalists' Club. Table 18 shows the plant and bird species found in the Rattray Marsh.

Table 18

Plant and Bird Species Found in Rattray Marsh

Vegetation Species	Bird Species
Indian Cucumber Root	Goshawk
Twisted Stalk	Sharp-Shinned Hawk
Black Oak	Red Tailed and Red Shouldered Hawk
Witch Hazel	Broad-winged Hawk
Canada Plum	Rough-Legged Hawk
Mountain Maple	Osprey
Swamp Lossestrife	Sparrow and Common Night Hawk
Small Enchanter's Nightshade	Barn Owl
Star Flower	Long and Short Eared Owl
Great Labdia	Snowy and Screech Owl
Turk's Cap Lily	Great Horned Owl

Source: A. A. Wainio, The Waterfront Study of Lake Ontario, pp. 180-182.

REFERENCE NOTE

[1] Ian D. MacDonald, *The Vegetation and Plant Species of Rattray Marsh*, Fowler Herbarium of Queen's University, Kingston, Ontario, April 1970.

CHAPTER XV

ENVIRONMENTAL PROTECTION AREAS

Environmental Protection Areas, as set out on Map 23, are defined as all lands having inherent physical/environmental hazards or limitations to development such as poor drainage, organic soils, flood susceptibility, erosion susceptibility and steep slopes.

Factors used to define these Environmental Protection Areas are as follows:[1]

1) Floodplains
2) Soil Conditions
3) Erosion and Slope Stability
4) Other Factors

Floodplains

Generally, the inventory of floodplains is done by qualified engineers through a special arrangement with local Conservation Authorities. The floodlines used to define floodplains are determined by using either a 1-in-100 year storm or a Regional Design Storm as determined by the Conservation Authorities Branch of the Ministry of Natural Resources.[2]

Soil Conditions

Certain soil types and conditions present problems for development. The soil types include organic and muck soils, and the soil conditions include shallow depths and poor drainage.[3]

Erosion and Slope Stability

The development-related problems associated with erosion and slope stability arise from the interrelationships of the degree of slope, the topographic break of slope, the eroding agent, and the type of material involved. There are three slope stability situations which are considered hazardous at all times:

1) Lakeshores with banks that are susceptible to slumping, wave erosion or wind erosion.

2) Major banks along watercourses which are actively being eroded, or which are subject to erosion during flooding

periods.

3) Leda clays associated with slopes.[4]

Special Factors

These factors include uncapped abandoned gas and oil wells, unstable abandoned mine shafts and Karst topography (weathered limestone areas).[5]

Two levels or categories of Environmental Protection Areas have been defined by the Ministry of Natural Resources:

Category (Level) 1 : Hazard Lands
Category (Level) 2 : Areas Undesirable for Development

In the Hazard Land Category, no development is permitted due to the risk of loss of life and property, the high cost of technology to overcome the hazard(s), and the likelihood that all taxpayers will have to bear the cost of remedial measures. In the Second Category (Areas Undesirable for Development), certain types of development may by permitted under specific conditions due to the lower risks and costs involved.[6]

On Map 23, Hazard Lands and Areas Undesirable for Development have been combined under the heading of Environmental Protection Areas for two reasons. One, it is difficult to show these two areas clearly differentiated at the scale of Map 23 (1:100,000 approx.). Two, considerable debate is currently going on in the Ministry of Natural Resources about various methods of mapping and treating lands in Category 2 (Areas Undesirable for Development). Hazard Lands and Areas Undesirable for Development are clearly delineated on maps available in the Region of Peel Planning Department (scale of 1" = 1320').

Map 24 shows the floodplains in Peel which have been legally defined by either the Metropolitan Toronto and Region Conservation Authority or the Credit Valley Conservation Authority. These floodplains are considered to be Category 1 Environmental Protection

Areas (i.e., Hazard Lands), and are the only examples of Environmental Protection Areas in Peel which have official (i.e., Provincial Policy) status at this time. These floodplains have been delineated by using Hurricane Hazel as the Regional Design Storm.

The current policies of the Ministry of Natural Resources and the Conservation Authorities with respect to legally defined floodplains include the following:

1) Generally no alteration of watercourses or floodplain limits permitted.

2) In urban situations, no lot intended for building purposes is permitted to extend into flood-susceptible areas.

3) No dumping of fill below floodlines is permitted without retaining stage storage and hydraulic characteristics of watercourses.

4) No buildings or structures below floodlines except those required for flood or erosion control.

5) Flood-proofing of habitable buildings and structures to one foot above design flood elevation in areas where these buildings and structures encroach upon the floodplain.

6) Building setbacks required from the floodline (the amount of setback varying with on-site conditions).

7) Any use not requiring the erection of permanent buildings and structures is generally permitted.

8) No sewage disposal or water supply system permitted.[7]

Present policies of the Ministry of Natural Resources in regard to other Hazard Land factors include the following:

Soil Conditions

1) No buildings.
2) No new lot intended for building purposes should extend into such areas.
3) No sewage disposal systems permitted.
4) Passive uses only permitted.
5) Setbacks for buildings required (the amount of setback dependant upon local conditions).[8]

Erosion and Slope Stability

1) No buildings or structures or lots intended for building purposes extending onto banks.

2) Alteration of banks permitted only after approval of

detailed engineering plans.

3) Minimum setback (where no remedial work undertaken, or when slope stability in doubt):

   a) 50 years of protection (50 times average annual erosion rate, where data available); or

   b) 2 times height of bank plus 25 or 50 feet.

4) Minimum setbacks (where remedial work undertaken, or when slope is stable): 50 feet.

5) Passive uses only permitted.[9]

Special Factors

1) No development until abandoned gas and oil wells are capped and abandoned mine shafts stabilized.

2) No development on Karst topography.[10]

Similar policies also exist for Category 2 Environmental Protection Areas (i.e., Areas Undesirable for Development), but since they are now being intensely scrutinized by staff of the Ministry of Natural Resources, they are not included in this Report.

Additional information concerning Environmental Protection Areas (and particularly those in Category 2) can be obtained from the Central Regional Office of the Ministry of Natural Resources.

REFERENCE NOTES

[1] Ministry of Natural Resources, Environmental Protection Areas (December, 1974), page 2.

[2] *Ibid.*, p. 3.

[3] *Ibid.*

[4] *Ibid.*, pp. 3-4.

[5] *Ibid.*, p. 4.

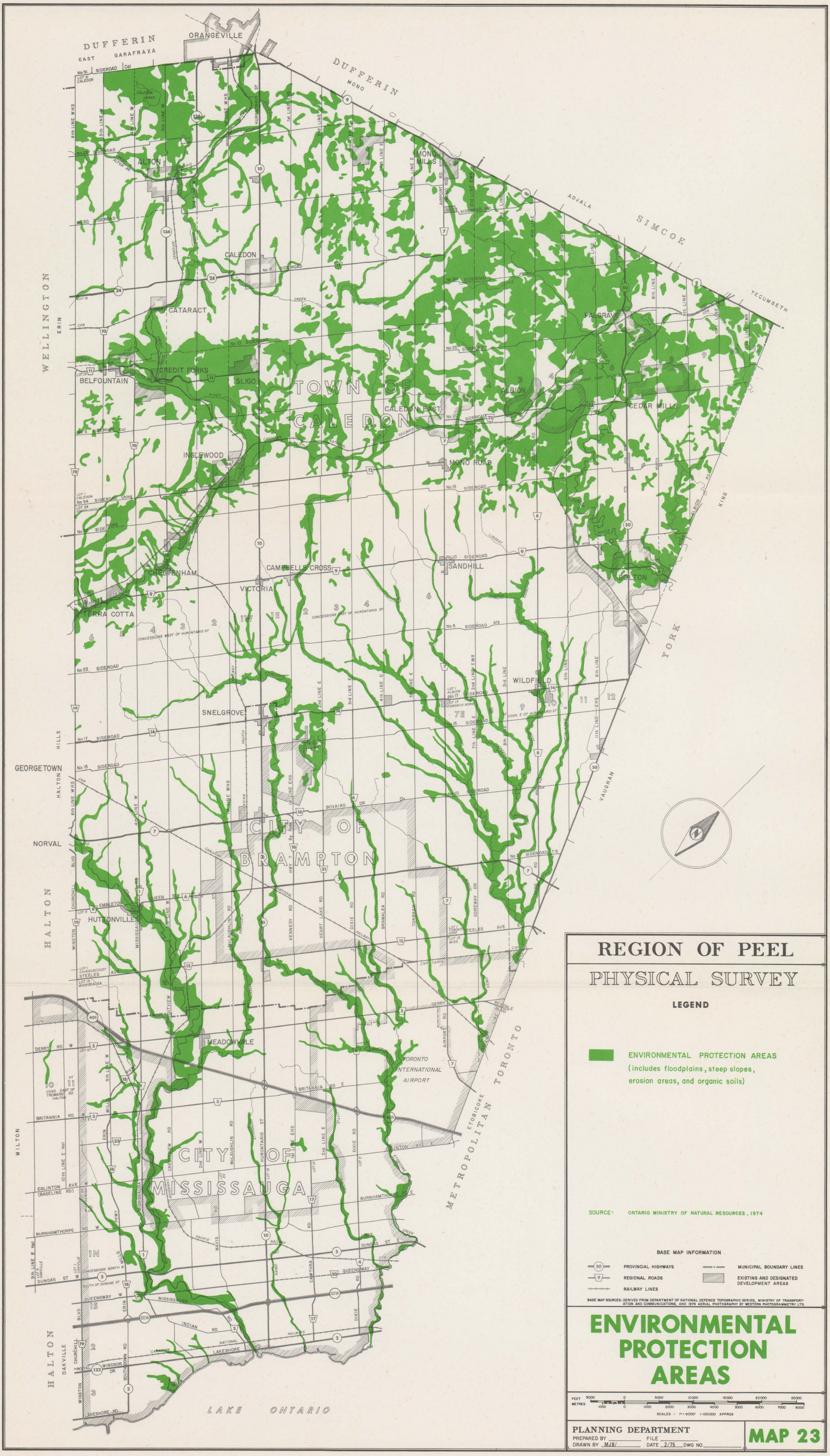
[6] *Ibid.*, p. 1.

[7] *Ibid.*, pp. 7-8.

[8] *Ibid.*, p. 9.

[9] *Ibid.*, pp. 8-9.

[10] *Ibid.*, p. 10.



REGION OF PEEL

PHYSICAL SURVEY

LEGEND

🟩 ENVIRONMENTAL PROTECTION AREAS
(includes floodplains, steep slopes, erosion areas, and organic soils)

SOURCE: ONTARIO MINISTRY OF NATURAL RESOURCES, 1974

BASE MAP INFORMATION

(50)	PROVINCIAL HIGHWAYS	— • —	MUNICIPAL BOUNDARY LINES
9	REGIONAL ROADS	▨	EXISTING AND DESIGNATED DEVELOPMENT AREAS
┼┼┼	RAILWAY LINES		

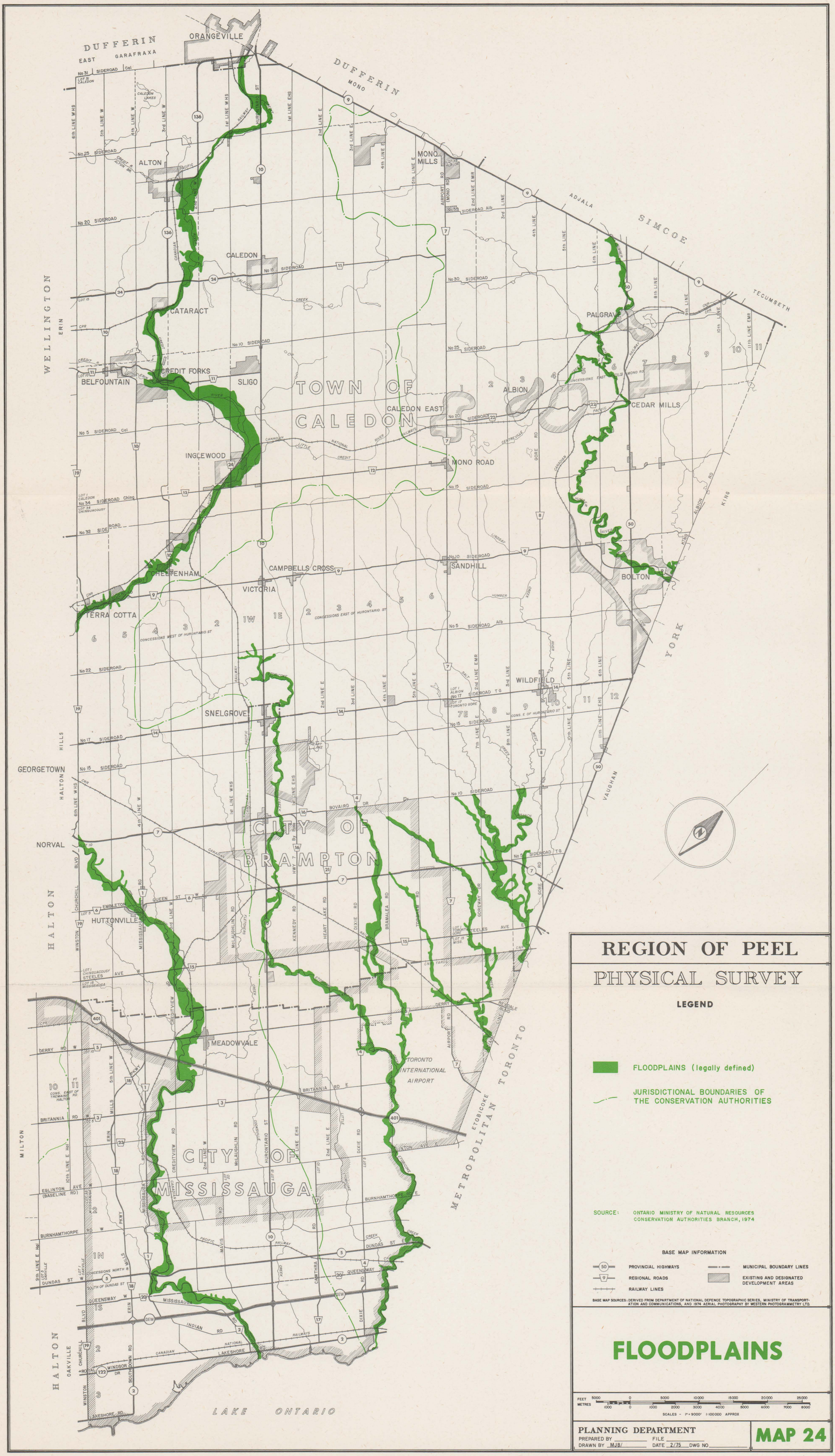
BASE MAP SOURCES: DERIVED FROM DEPARTMENT OF NATIONAL DEFENCE TOPOGRAPHIC SERIES, MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, AND 1974 AERIAL PHOTOGRAPHY BY WESTERN PHOTOGRAMMETRY LTD.

ENVIRONMENTAL PROTECTION AREAS

FEET 5000 0 5000 10000 15000 20000 25000
METRES 1000 0 1000 2000 3000 4000 5000 6000 7000 8000
SCALES - 1" = 9000' 1:100000 APPROX

PLANNING DEPARTMENT
PREPARED BY ________ FILE ________
DRAWN BY MJB/ DATE 2/75 DWG NO ________

MAP 23



REGION OF PEEL

PHYSICAL SURVEY

LEGEND

🟩 FLOODPLAINS (legally defined)

JURISDICTIONAL BOUNDARIES OF THE CONSERVATION AUTHORITIES

SOURCE: ONTARIO MINISTRY OF NATURAL RESOURCES CONSERVATION AUTHORITIES BRANCH, 1974

BASE MAP INFORMATION

(50)	PROVINCIAL HIGHWAYS		MUNICIPAL BOUNDARY LINES
(9)	REGIONAL ROADS	▨	EXISTING AND DESIGNATED DEVELOPMENT AREAS
	RAILWAY LINES		

BASE MAP SOURCES: DERIVED FROM DEPARTMENT OF NATIONAL DEFENCE TOPOGRAPHIC SERIES, MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, AND 1974 AERIAL PHOTOGRAPHY BY WESTERN PHOTOGRAMMETRY LTD.

FLOODPLAINS

FEET 5000 0 5000 10000 15000 20000 25000
METRES 1000 0 1000 2000 3000 4000 5000 6000 7000 8000
SCALES - 1" = 9000' 1:100000 APPROX

PLANNING DEPARTMENT
PREPARED BY ________ FILE ________
DRAWN BY MJB/ DATE 2/75 DWG NO ________

MAP 24

CHAPTER XVI

EXISTING LAND USE, TRANSPORTATION FACILITIES AND UTILITIES

Existing Land Use

The Cities of Mississauga and Brampton in the southern portion of the Region of Peel are, and undoubtedly will continue to be, subject to pressures of very rapid urban growth. The extent of urbanization in these two Area Municipalities, as well as in the Town of Caledon and in the Region of Peel as a whole, is revealed in Table 19 below (refer to Map 25).

Table 19

Proportion of Urban and Rural Land in Peel (1974)

	% Urban	% Rural
City of Mississauga	50	50
City of Brampton	20	80
Town of Caledon	3	97
Region of Peel	16	84

According to current population projections for the Cities of Mississauga and Brampton, urban growth will significantly reduce the rural land proportions in these two Municipalities over the next few decades.

The following Table (Table 20) sets out the major existing land uses in the built-up portions of the Cities of Mississauga and Brampton, expressed as percentages of the total urban area within each of the Municipalities.

Table 20

Existing Land Use, 1974
(Expressed as a % of the total urban area)

	Residential	Industrial	Commercial	Open Space	Institutional	Total
City of Mississauga	50	30	5	13	2	100
City of Brampton	55	30	5	6	4	100

This Table indicates a significant consistency in the percentages of land in various broad land use categories, particularly Residential, Commercial and Industrial.

The Town of Caledon is predominantly rural with several relatively small settlements, some estate-type residential subdivisions, and numerous scattered dwellings. The largest settlements are the former Town of Bolton and the former Villages of Caledon and Caledon East. Industrial development in the Town of Caledon is centred in Bolton.

Transportation Facilities

The Region of Peel is served by road, rail, air and water transportation systems. Each of these accommodates private and common carrier freight and passenger transportation within and through the Region. Due to the current rapid growth in Peel, these systems are undergoing significant change in response to increasing demands.

The roadway system at the present time serves the greatest portion of the Regional and inter-Regional transportation demand. Within the Region, the major freeways and highways are under Provincial jurisdiction and include the following: Q.E.W, #7, #10, #24, #50, #136 and #401. These are components of the Provincial network of highways, providing relatively high speed road transportation between major centres in Ontario.

The Regional Municipality of Peel at present has jurisdiction over approximately 220 miles of roads, providing major road links between activity centres in the Region. The remaining roads come under the jurisdiction of the Area Municipalities of Mississauga, Brampton and Caledon.

In a few instances, the responsiblity for construction and maintenance of portions of Provincial Highways has been assumed by Regional or Area governments.

Various lines of the C.N.R. and C.P.R. traverse the Region of Peel. The Canadian National and Canadian Pacific east-west routes through Mississauga and Brampton are major lines which both provide freight service. The C.N.R. line, however, is the only one which also provides passenger service.

Both Mississauga and Brampton have transit systems, with a dial-a-bus component serving the Bramalea area of Brampton. The Lakeshore GO-Transit has stations at Clarkson and Port Credit in Mississauga, and the GO-Transit Northwest has stations at Malton, Bramalea and the former Town of Brampton.

Toronto International Airport is located in the eastern part of the Region, and is of major significance to the Region because of the economic opportunities and the environmental impacts it generates.

The Lake Ontario frontage offers only limited opportunities for harbour development for transportation of goods. It does, however, provide significant potential for pleasure boating and water-oriented recreation.

Utilities*

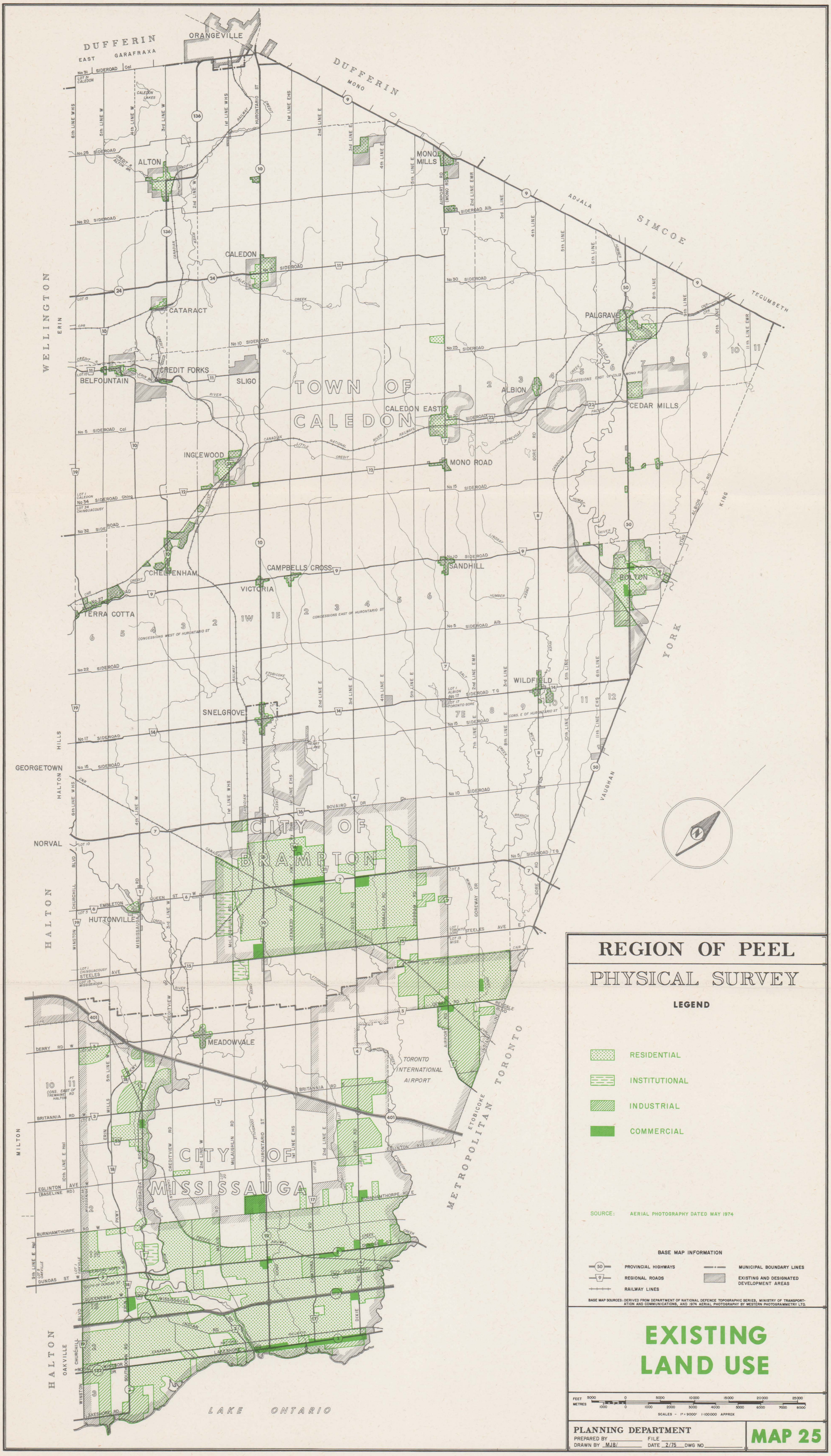
At present, hydro-electric power service is generally available throughout the Region of Peel. There are seven existing major transmission corridors varying from approximately 100 feet to 275 feet in width. The largest transmission line at present is 230 KV, with a 500 KV line proposed along the alignment of the Northern Link of the Parkway Belt between Mississauga and Brampton.

The responsibility for the supply and distribution of piped water in the urban areas of Peel in Mississauga and Brampton is shared

* Refer to Map 26.

by the Regional Municipality of Peel and the Ministry of the Environment. The Ministry owns and operates the water treatment plant at Lakeview as well as some of the major trunks. The design capacity of the Lakeview Water Treatment Plant is 50 million gallons per day, with a maximum peak capacity of 75 million gallons per day. Currently, on the average, 32 million gallons per day are purified with a peak of 63 million gallons per day reached in 1974. Another treatment plant, with 50 million gallons per day design capacity, is being planned by the Ministry for construction at Clarkson. Development in Caledon is primarily served from wells, with major residential areas served by piped systems from well sources.

Responsibility for the provision of sewage treatment plants and trunk sanitary sewer systems is also shared by the Region and the Ministry of the Environment. The Ministry owns major trunks along the Credit River and the Etobicoke Creek, and treatment plants at Lakeview and Clarkson. These systems serve only Mississauga and Brampton. With the notable exception of Bolton, development in Caledon is primarily dependent upon individual septic tank systems. Bolton has a treatment plant with some capacity limitations, as well as constraints imposed by the limited capability of the Humber River to satisfactorily accommodate discharged effluent.



REGION OF PEEL

PHYSICAL SURVEY

LEGEND

▒	RESIDENTIAL
▤	INSTITUTIONAL
▨	INDUSTRIAL
■	COMMERCIAL

SOURCE: AERIAL PHOTOGRAPHY DATED MAY 1974

BASE MAP INFORMATION

(50)	PROVINCIAL HIGHWAYS	—•—	MUNICIPAL BOUNDARY LINES
9	REGIONAL ROADS	▨	EXISTING AND DESIGNATED DEVELOPMENT AREAS
+++	RAILWAY LINES		

BASE MAP SOURCES: DERIVED FROM DEPARTMENT OF NATIONAL DEFENCE TOPOGRAPHIC SERIES, MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, AND 1974 AERIAL PHOTOGRAPHY BY WESTERN PHOTOGRAMMETRY LTD.

EXISTING LAND USE

FEET 5000 0 5000 10000 15000 20000 25000
METRES 1000 0 1000 2000 3000 4000 5000 6000 7000 8000
SCALES - 1" = 9000' 1:100000 APPROX

PLANNING DEPARTMENT
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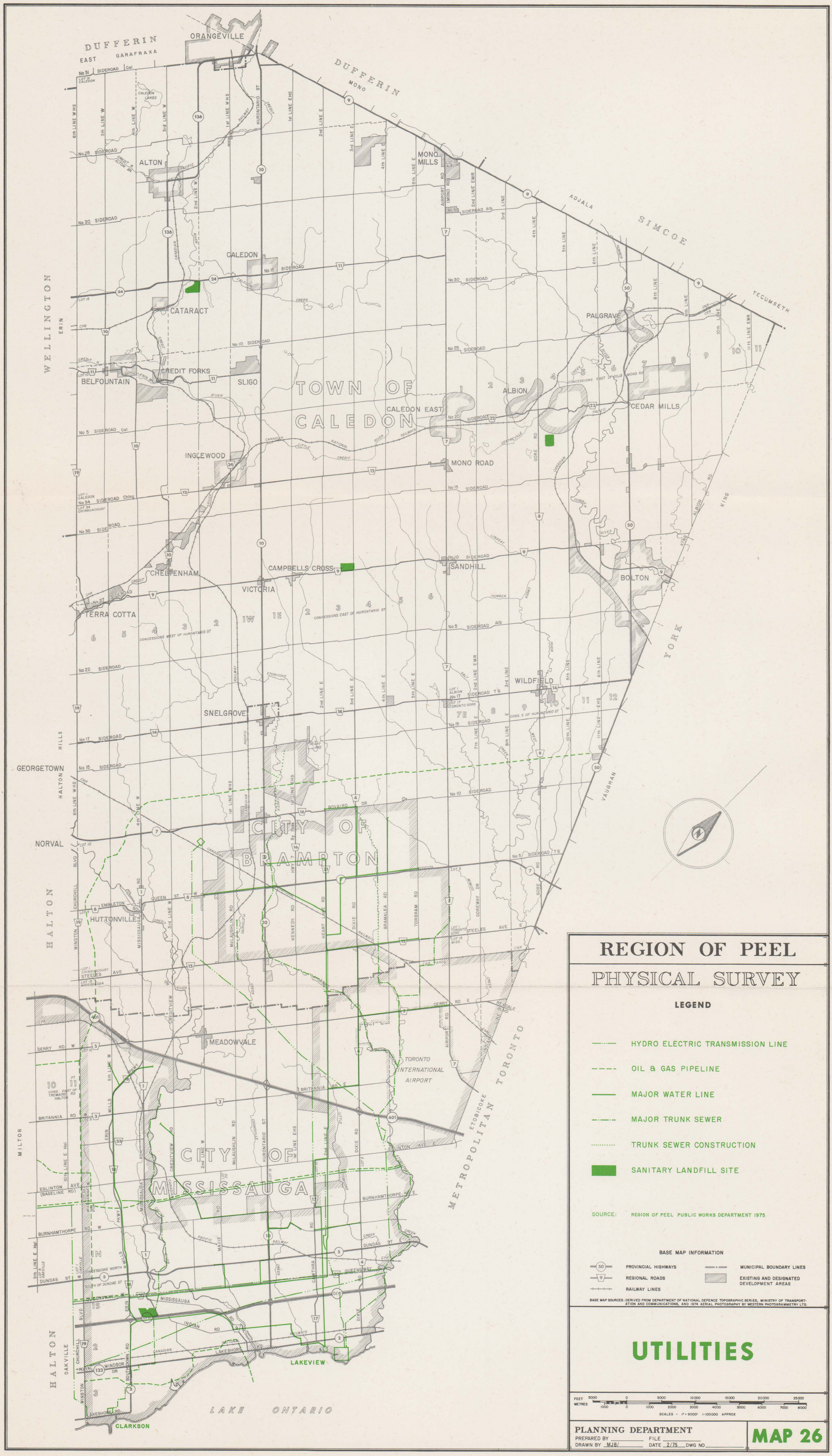
MAP 25



REGION OF PEEL

PHYSICAL SURVEY

LEGEND

HYDRO ELECTRIC TRANSMISSION LINE

OIL & GAS PIPELINE

MAJOR WATER LINE

MAJOR TRUNK SEWER

TRUNK SEWER CONSTRUCTION

🟩 SANITARY LANDFILL SITE

SOURCE: REGION OF PEEL PUBLIC WORKS DEPARTMENT 1975

BASE MAP INFORMATION

50	PROVINCIAL HIGHWAYS		MUNICIPAL BOUNDARY LINES
9	REGIONAL ROADS	▨	EXISTING AND DESIGNATED DEVELOPMENT AREAS
	RAILWAY LINES		

BASE MAP SOURCES: DERIVED FROM DEPARTMENT OF NATIONAL DEFENCE TOPOGRAPHIC SERIES, MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, AND 1974 AERIAL PHOTOGRAPHY BY WESTERN PHOTOGRAMMETRY LTD.

UTILITIES

FEET 5000 0 5000 10000 15000 20000 25000
METRES 1000 0 1000 2000 3000 4000 5000 6000 7000 8000
SCALES - 1" = 9000' 1:100000 APPROX

PLANNING DEPARTMENT
PREPARED BY ______ FILE ______
DRAWN BY MJB/ DATE 2/75 DWG NO ______

MAP 26

CHAPTER XVII

JURISDICTIONS

Some of the Government Agencies which operate in the Region of Peel and which have an influence on the planning and development of The Peel Planning Area are listed below:

1) Regional Municipality of Peel
2) City of Mississauga
3) City of Brampton
4) Town of Caledon
5) Various Ministries of the Provincial Government, and particularly:
    a) Treasury, Economics and Intergovernmental Affairs (Regional Planning Branch, Parkway Belt Task Force)
    b) Transportation and Communications
    c) Housing (Plans Administration Division, Ontario Housing Action Programme)
    d) Environment (South Peel Sewer and Water System)
    e) Natural Resources (environmental protection areas, parks, licencing of pits and quarries)
6) Conservation Authorities (Metropolitan Toronto and Region Conservation Authority, Credit Valley Conservation Authority and Halton Region Conservation Authority)
7) Ontario Hydro
8) Niagara Escarpment Commission
9) Toronto Area Transit Operating Authority
10) Federal Ministry of Transport, Canadian Air Transportation Administration (Toronto International Airport)

The following is a brief description of how three of these Agencies affect Peel.

Niagara Escarpment Commission

The Niagara Escarpment Planning and Development Act, 1973 became law on June 22, 1973. The main purpose of the Act is to provide for the maintenance of the lands in the Niagara Escarpment Planning Area (N.E.P.A.) as a continuous natural environment, and to ensure that only such development occurs as is compatible with this natural environment. The Niagara Escarpment Planning Area covers 145 square miles in the Region of Peel, or 30% of the total land area in Peel (all within the Town of Caledon). Refer to Map 27.

The Minister has established The Niagara Escarpment Commission, composed of seventeen members (nine from the public at large and the remaining eight from County and Regional Councils). The Commission is to prepare The Niagara Escarpment Plan and is to consult with the various municipalities throughout the preparation of the Plan, with respect to its proposed contents. In addition, the Minister is to establish two or more advisory committees consisting of such persons as the Minister appoints.

The legislation allows the Commission to incorporate into the Plan guidelines covering:

1) Programs and policies for the economic, social and physical development of the area;
2) Policies relating to the financing and scheduling of both Provincial and municipal public works;
3) Co-ordination of Provincial and local planning and development;
4) Policies to ensure that private development will be compatible with the Plan.

Before the Plan is formally adopted, local and Regional Municipalities will be invited to comment on the proposed Plan (given at least three month's time). Public hearings will also be conducted for the purpose of receiving public representations. After the Plan is approved, Regional municipalities will have the opportunity to make application for amendments. If there are conflicts between local plans and the Niagara Escarpment Plan, the municipality may submit proposals for the resolution of the conflict. The Minister will review the proposals and will make the final decision. Once the Plan is in effect, no municipality shall undertake any improvement of a structural nature or pass a by-law for any purpose that is in conflict with the Niagara Escarpment Plan.

The Act states that in the designated Niagara Escarpment Planning Area, Provincial policies and plans will take precedence over municipal Official Plans and zoning by-laws. Municipalities will be required to amend their plans to accord with The Niagara Escarpment Plan.

Where a municipality does not have a local plan or by-law for any area within the Plan, the Minister will direct them to prepare local plans and by-laws, which shall conform with the Niagara Escarpment Plan. Provincial funds will be available to assist municipalities that must adopt or amend plans and by-laws. Funds are also available for implementation of the Niagara Escarpment Plan. The Legislation requires a mandatory five year review of the Plan.

During the preparation of the Plan, and after its adoption, land use will be controlled through the technique of "Development Control." Special development control areas will be designated by the Minister. No person shall undertake any development in these designated areas unless he obtains a development permit issued by the Minister. Eventually, this authority may be delegated to a Regional municipality which must make application to the Minister for this responsibility. All land owners within 400 feet of a proposed development must be notified and given fourteen days to appeal to the Minister in writing. If there is a sufficient objection, the Minister will appoint a hearing officer and a public hearing will be conducted.

For the purpose of developing and implementing any component of the Niagara Escarpment Plan, the Minister has the power to expropriate any lands within the Niagara Escarpment Planning Area and may sell, lease or otherwise dispose of any such land or interest in it.

When the Niagara Escarpment Plan is substantially completed, the functions of the Commission may be transferred to the council of a Regional Municipality upon application.

Parkway Belt West
(Parkway Belt Task Force, Ministry of Treasury, Economics and Intergovernmental Affairs)

In June 1973, The Parkway Belt Planning and Development Act, 1973 was passed to provide a legal context for the preparation of the Parkway Belt Plan, and to permit the imposition of land use regulations in the Parkway Belt Planning Area.

The Parkway Belt is based upon the following principles:

1) To define and separate communities and thus to give people a sense of community identity.

2) To link communities with service corridors which can facilitate the movement of people, goods, energy and information without disrupting community integrity.

3) To provide a land reserve for the future, anticipating land uses that cannot be foreseen today.

4) To offer open space and recreational facilities where they are most needed - adjacent to the urban complex.

Within the Region of Peel, there are four major links in the Parkway Belt: The Oakville-Mississauga link, the northern and southern links, and the airport minibelt. The northern link defines the southern limit of the City of Brampton. It contains a portion of Highway #401, and the future Highway #407, along with the proposed 500 KV transmission corridor and a future utility line. The southern link separates "southern" Mississauga from Erin Mills-Meadowvale. The proposed Highway #403 will be within this section of the Parkway Belt, along with an existing 230 KV transmission line and a proposed 100 foot wide strip reserved for future utilities. The airport minibelt is designed to prevent the merging of future urban places and contains proposed Highway #410. Highway #410 will link proposed Highways #403 and #407.

The Provincial Government is committed to an "open planning" process which permits a wide range of public participation in the development of a final Plan. Upon the completion of a detailed Design Plan, the Province is required, under The Ontario Planning and Development Act, to make the Design Plan and supporting materials available to all affected municipalities and the two Parkway Belt Committees for comments and modifications. The general public will have access to the same materials for examination and comments. The Minister will appoint an agent to conduct a public hearing at an appropriate time, to assist in finalizing and modifying the Design Plan for Government adoption.

Upon the adoption of The Parkway Belt Design Plan, the Government will embark upon a long-term acquisition program for the public open space, transportation and utility service corridors. A great deal of land within the Parkway Belt may remain under private ownership. "Complementary uses" will be permitted on this privately owned land.

The final approved Plan will be binding upon all affected municipalities. No development will be permitted that conflicts with the Plan. Municipal Official Plans will have to be amended to conform with the adopted Parkway Belt Plan, and when these Official Plans and local zoning by-laws conform with the Parkway Belt Plan, the temporary Provincial land use regulations will be rescinded.

The Conservation Authorities

The total land area in the Region of Peel is approximately 488 square miles. Of this, about 55.6% is under the jurisdiction of the Metropolitan Toronto and Region Conservation Authority, 44% under the jurisdiction of the Credit Valley Conservation Authority, and 0.4% under the jurisdiction of the Halton Region Conservation Authority.

The Credit Valley Conservation Authority (C.V.C.A.)

In 1954, at the request of the sixteen municipalities in the Credit River Watershed (about 400 square miles in area), the Ontario Government formed the Credit Valley Conservation Authority by Order-in-Council.

At present, the Regional Municipality of Peel, the City of Mississauga, the City of Brampton and the Town of Caledon are members of this Authority.

The Metropolitan Toronto and Region Conservation Authority (M.T.R.C.A.)

This Authority was established in 1957 by the merging of four existing conservation authorities in the Metropolitan Toronto region. The Authority currently has jurisdiction over an area comprising approximately 1126 square miles.

In the Region of Peel, the Humber River, Mimico Creek and Etobicoke Creek Watersheds (comprising in total an area of 271 square miles), are included as part of the nine watersheds over which the M.T.R.C.A. has jurisdiction.

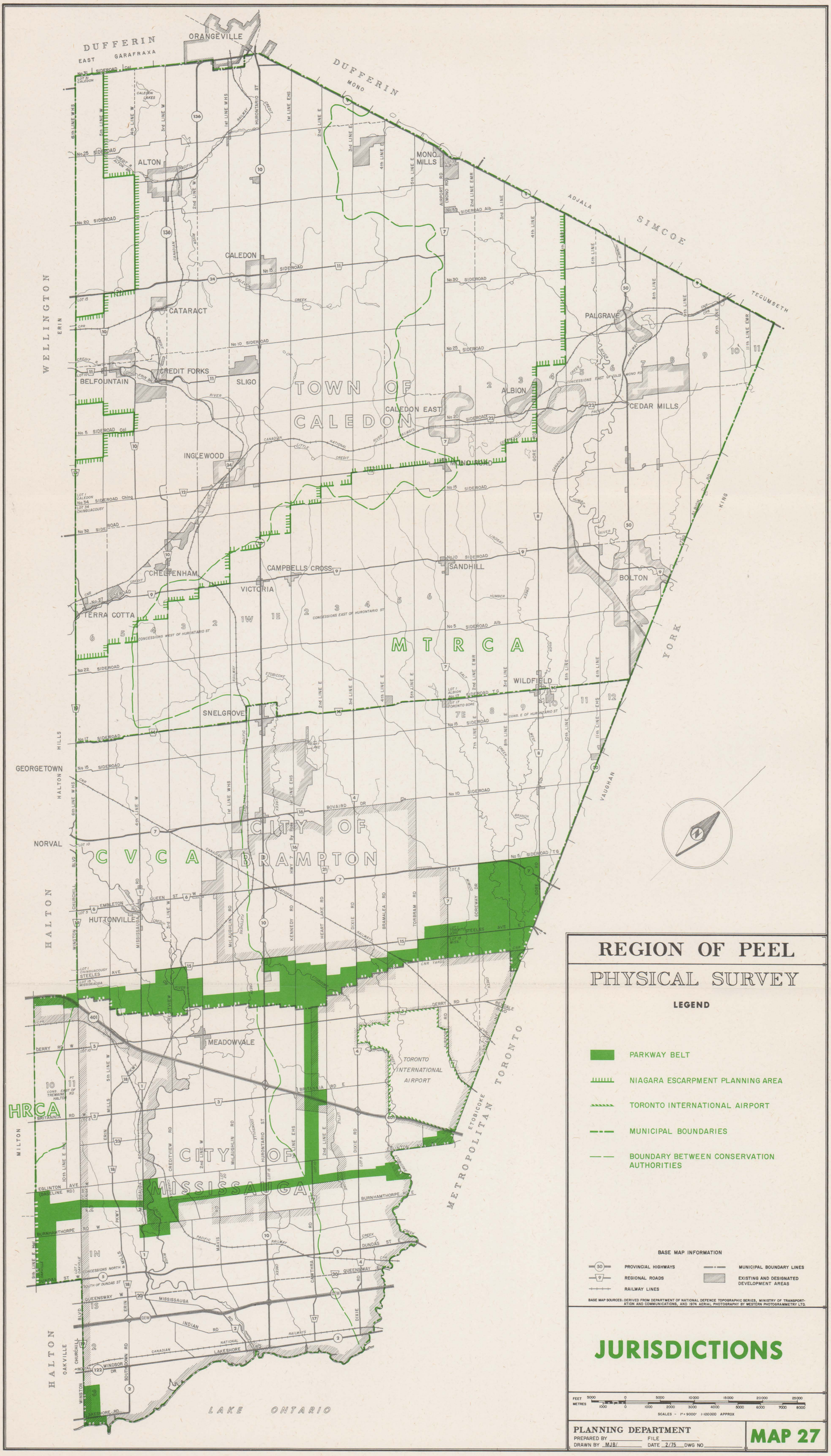
The Regional Municipality of Peel, the City of Mississauga, the City of Brampton and the Town of Caledon are all members of this Authority.

Functions of the Authorities

The following is a list of the major functions or responsibilities of The Conservation Authorities:

1) Major flood control and channel improvement projects.
2) Management of water, forest, fish and wildlife resources for conservation purposes and recreational uses.
3) Erosion and sedimentation control and slope stabilization.
4) Strategic land use planning and the management of Authority-owned lands for recreational uses.
5) Regulation of fill and construction and the alteration of waterways within designated floodplains.
6) Submission of comments to the Ministry of Housing on official plans, official plan amendments, subdivisions and land severance applications, etc.
7) The planning and development of waterfront areas.

The Authorities are financed by per capita levies imposed on participating municipalities. For general conservation work, the Authorities receive grants from the Province of Ontario. For major flood control, channel improvement and water conservation projects, the Authorities also obtain financial assistance from the Federal Government. Revenue producing projects of the Authorities help to defray operating costs.



REGION OF PEEL

PHYSICAL SURVEY

LEGEND

🟩	PARKWAY BELT
⫼	NIAGARA ESCARPMENT PLANNING AREA
▨	TORONTO INTERNATIONAL AIRPORT
—·—	MUNICIPAL BOUNDARIES
— —	BOUNDARY BETWEEN CONSERVATION AUTHORITIES

BASE MAP INFORMATION

(50)	PROVINCIAL HIGHWAYS	—·—	MUNICIPAL BOUNDARY LINES
9	REGIONAL ROADS	▨	EXISTING AND DESIGNATED DEVELOPMENT AREAS
+++	RAILWAY LINES		

BASE MAP SOURCES: DERIVED FROM DEPARTMENT OF NATIONAL DEFENCE TOPOGRAPHIC SERIES, MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, AND 1974 AERIAL PHOTOGRAPHY BY WESTERN PHOTOGRAMMETRY LTD.

JURISDICTIONS

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SCALES - 1" = 9000' 1:100000 APPROX

PLANNING DEPARTMENT
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MAP 27

CHAPTER XVIII

CONCLUSION

This Physical Survey Report has been prepared to identify and document the various elements that collectively make up the natural physical environment of the Region of Peel. These elements provide potentialities for man's activities as well as some restrictions and constraints. The location of the Region of Peel adjacent to Metropolitan Toronto means that urban growth demands on the land area in Peel are intense, and will continue to be so. The population projections of the Regional Planning Department's Background Report on Population Growth give an indication of the possible magnitude of these growth demands. At the same time, considerable pressure is being and will be exerted against urbanization in Peel in order to ensure the preservation of areas for food production, mineral extraction and open space recreation.

Some land uses are essentially compatible and complementary. Urban uses may be in close proximity to areas set aside for certain conservation and recreation uses, and many recreation, conservation, agricultural and forestry uses can co-exist. On the other hand, the juxtaposition of some land uses may well create serious conflict; for example, areas with very high natural scenic qualities may also have a high capability for recreation, food production, mineral extraction or housing. In some instances, if the competing land use is successful, unique natural amenities and opportunities may be lost forever. The Physical Survey Report will assist Regional Council, the Area Municipalities and other public agencies in adopting planning policies which encourage the preservation of these unique natural amenities and opportunities and which, at the same time, enable urban growth to be accommodated with as few negative environmental effects as possible.

GLOSSARY OF TECHNICAL TERMS

alluvium:	any unconsolidated clay, silt, sand, gravel etc. deposited by a stream or other running water during recent (generally speaking post-Pleistocene) geologic time.
aquiclude:	a body of relatively impermeable rock that is capable of absorbing water slowly, but functions as an upper or lower boundary to an aquifer, and does not transmit groundwater rapidly enough to supply a well or spring.
aquifer:	a body of rock that contains sufficient saturated permeable material to conduct groundwater and to yield economically significant quantities of water to wells and springs.
argillaceous:	containing an appreciable amount (but less than 50%) of clay-size particles or clay minerals.
artesian:	pertaining to groundwater confined under hydrostatic pressure.
artesian aquifer:	confined aquifer.
artesian well:	a well tapping a confined aquifer where the potentiometric head is higher than the land surface so that water flows out of the top of the well.
bioherm:	a mound, lens or reef-like mass of rock built up by and composed almost exclusively of the remains of sedentary organisms such as corals, algae, foraminifers, mollusks, gastropods and stromatoporoids, and enclosed or surrounded by rock of different composition.
biostratigraphic:	referring to a stratum or body of strata defined by its fossils, without regard to its lithology or other physical features.
brachiopod:	a solitary marine invertebrate with two bilaterally symmetrical valves.
calcareous:	containing calcium carbonate ($CaCO_3$) - up to 50% of the rock.
calcite:	a common rock forming mineral, calcium carbonate ($CaCO_3$). The chief constituent of limestone.
chert:	cryptocrystalline quartz - hard and extremely dense.
deltaic:	pertaining to a delta. A deltaic deposit is characterized by well developed local crossbedding and by a mixture of sands, silts and clay, and the remains of organisms and some organic matter.
dolomite:	i) the mineral calcium magnesium carbonate ($CaMg(CO_3)_2$) ii) a carbonate sedimentary rock composed chiefly (more than 50%) of calcium magnesium carbonate.

dolostone:	a term proposed by Shrock (1948) for the sedimentary rock dolomite to avoid confusion with the mineral of the same name.
drift:	a general term applied to all rock material transported by ice and deposited directly from the ice or meltwater emanating from the ice. Includes all glacial deposits.
drumlin:	a low, smooth, oval-shaped hill of compact glacial till built under the margin of the ice and shaped by its flow (or carved out of an older moraine by re-advancing ice). Its longer axis is parallel to the direction of ice movement. It usually has a blunt nose pointing in the direction from which the ice approached and a gentler slope tapering in the other direction. Drumlins vary in size from small mounds to hillocks up to 180' above the till plain and over a mile long. Usually they are ¼ - 1 mile in length, not more than ¼ mile wide and 50-75 feet high. Often they occur in swarms, giving a "basket of eggs" style to the landscape.
end moraine:	a moraine produced at the front of an active glacier at any given time; a moraine that has been deposited at the lower end of a glacier. The term "terminal moraine" is sometimes used synonymously with end moraine, but strictly speaking, implies the end moraine produced at the maximum advance of the ice sheet or glacier.
esker:	a long, low, narrow, sinuous ridge or mound composed of irregularly stratified sand and gravel that was deposited by a subglacial stream flowing between ice walls or in an ice tunnel of a retreating ice sheet or glacier.
evapotranspiration:	loss of water from a land area through evaporation from the soil and through transpiration from plants.
facies:	a term used to signify a "type" of rock with certain lithologic and/or fossiliferous characteristics, in close proximity and genetically related to another with different characteristics. The term implies change and the existence of a different, but related, rock type (cf. "transitional facies").
fissile:	capable of being easily split along closely spaced planes; in the case of shale, usually along bedding planes consisting of laminae less than 2mm. thick.
formation:	the basic rock-stratigraphic unit in the local classification of rocks, consisting of a stratum or strata characterized by some common distinctive lithologic features (such as chemical composition, structures, and texture or gross aspect of fossils).
fossil:	any remains, trace or imprint of past life preserved in the earth's crust.
fossiliferous:	containing fossils.
gastropod:	a mollusk with a simple calcareous shell closed at the apex, sometimes spiralled, but not chambered. e.g. snails.

geode:	a hollow, partly hollow, or nearly filled globular nodule containing minerals (often crystals) different from the surrounding rock. Geodes can be 1 inch to more than a foot in diameter. They are sometimes found in limestones and shales.
glacial:	of, or pertaining to, the activities of ice or glaciers, and the features and materials produced by or derived from ice sheets and glaciers.
glaciofluvial:	pertaining to the meltwater streams flowing from melting ice and especially to the deposits and landforms produced by such streams (synonymous with "fluvioglacial").
glaciolacustrine:	pertaining to, derived from, or deposited in glacial lakes - especially the deposits brought by meltwater streams flowing into lakes bordering an ice mass, such as varved clays.
gypsum:	a mineral consisting of hydrous calcium sulphate ($CaSO_4.2H_2O$). Very soft, white or colorless when pure. (Used in making "plaster of Paris"; occurs in shales where it is an unwelcome impurity in brick and tile manufacture.)
ice-contact stratified drift:	stratified (layered) drift deposited in contact with melting glacial ice, such as kames, eskers, kame terraces.
interlobate moraine:	a moraine formed between two adjacent glacial lobes and whose origin rests partly in each lobe.
igneous rock:	a rock which solidified from molten or partly molten material, such as gabbro, some granites etc.
kame:	an irregular, low hummocky ridge, or mound or hill composed of poorly sorted stratified sand and gravel, deposited by a subglacial stream as an alluvial fan or delta against or upon the terminal margin of a melting glacier, and generally aligned parallel to the ice front.
kame-moraine:	an end moraine containing numerous kames.
kame topography:	a hummocky or undulating morainal topography with a disordered assemblage of knolls, mounds or ridges, mostly of kame origin and interspersed with irregular, often undrained depressions or kettles (="knob and kettle topography", "kame and kettle topography").
kettle lake:	a lake in a basin-shaped depression (kettle) in glacial drift, formed by the melting of a large detached block of stagnant ice left behind by a retreating glacier.
lacustrine:	pertaining to, or formed in a lake or lakes.
limy:	calcareous.

lithology:	the physical character of rocks, especially sedimentary rocks in hand specimen or outcrop, on the basis of such characteristics as color, structures, mineral composition and grain size.
lithostratigraphic:	(=rock stratigraphic unit) a rock unit having a substantial degree of homogeneity, consisting dominantly of a certain rock type or combination of rock types and considered completely independent of time and therefore fossils (e.g., A group, formation, or a bed is a lithostratigraphic unit).
loam:	a soil type consisting of clay, silt and sand in roughly equal proportions. Sometimes also used in description of glacial drift.
marl:	an earthy substance containing 35-65% clay and 35-65% carbonate - formed under marine or freshwater (eg. lakes) conditions.
meltwater channel:	the channel carrying water or outwash from a melting ice sheet or glacier (see "spillway").
metamorphic rock:	a rock which has undergone mineralogical and structural change in the solid state from its original form and composition, deep within the earth, and usually under conditions of intense heat and/or pressure.
moraine:	a ridge or hilly area of unsorted, unstratified glacial drift, predominantly till, deposited chiefly by direct action of the ice in a variety of topographic landforms that are independent of control by the bedrock surface on which the drift lies.
morainal topography:	the landscape characteristic of moraines - i.e. an irregular hummocky landscape of scattered hills and undrained depressions (often with kettle lakes).
muck soil:	soil containing 20-50% organic matter, well decomposed.
Ordovician:	the second earliest period of the Palaeozoic era, between the Cambrian and Silurian, covering a time span between 500 and 430-440 million years ago. Also the corresponding system of rocks.
outwash:	stratified detritus (usually sand and gravel) washed out from a glacier by meltwater streams and deposited in front of, or beyond, the end moraine or margin of the ice in meltwater channels as outwash terraces, kames, etc.
overburden:	material deposited on top of the bedrock. Generally unconsolidated and of glacial and post-glacial (recent) origin. A general term for all glacial drift and recent deposits.
Palaeozoic:	an era of geologic time from the end of the Precambrian to the beginning of the Mesozoic - roughly 570-250 million years B.P. The base of the Palaeozoic is the Cambrian period (and system of rocks) characterized by the commencement of the fossil record of invertebrate life. (B.P. means Before Present)
physiography:	a description of natural features and their causal relationships.
Pleistocene:	an epoch of the Quaternary period and the corresponding series of rocks, after the Pliocene of the Tertiary and before the Holocene or Recent. The Pleistocene extends from about 2 million years to 10,000 years B.P. and is largely synonymous with the "ice age" in

	North America and Northern Europe.
Precambrian:	All of geologic time and the corresponding rocks before the Palaeozoic, characterized by the absence of regular fossils. It is equivalent to about 90% of all geologic time. Most Precambrian rocks in Canada form the Canadian Shield, and are metamorphic.
Potentiometric surface and Piezometric surface:	synonymous terms for an imaginary surface representing the static head of groundwater and defined by the level to which water will rise in a well.
quartzose:	containing quartz as a principal constituent.
reefy:	containing reefs - in this text it refers to fossil reefs, usually bioherms, which are largely calcareous and highly fossiliferous (also see "bioherm").
shale:	a fine-grained, sedimentary rock formed by the consolidation of clay, silt, or mud and characterized by finely stratified structure or fissility, with laminae 0.1 - 0.4 mm. thick; the fissility approximately parallel to the bedding and along which the rock readily breaks into thin layers.
Silurian:	a period and corresponding system of rocks, following the Ordovician. Time span from 430-440 to 395 million years ago.
spillway:	strictly speaking, an overflow channel, but often loosely used synonymously with "meltwater channel".
stratigraphic sequence:	a chronologic succession of sedimentary rocks or deposits from older below to younger above.
stratum (pl. strata):	a tabular or sheet-like mass or single layer of homogenous or gradational sedimentary material (either consolidated rock or unconsolidated earth or drift). Generally used synonymously with "bed".
subartesian well:	a well which traps groundwater (in a confined aquifer) with a potentiometric head higher than the water-table so that water rises in the well, but not high enough to reach the land surface (cf. "artesian").
transitional facies:	the zone between two distinct facies or types of rock; where there is a facies change.
till:	unsorted and unstratified drift, usually unconsolidated, and deposited directly by and underneath a glacier without any reworking by water. A heterogenous mixture of clay, sand, gravel and boulders (syn. "boulder clay").
varved clay:	a distinctly laminated lacustrine sediment consisting of varves. A varve is a thin pair of graded layers, seasonally deposited (usually by meltwater streams) in a glacial lake. Each pair of layers or laminae consists of a lower "summer" layer of relatively coarse-grained, light colored sediment (sand or silt) deposited by water from melting ice in the warmer months, which grades upwards into a thinner "winter" layer of dark, often organic, clayey sediment deposited slowly from quiet water whilst the streams were frozen in winter. Each varve thus represents one years cyclic deposit. Counting and correlation of

	varves are sometimes employed in measuring ages of Pleistocene glacial deposits.
water-table:	the surface between the zone of saturation and the zone of aeration: that surface of a body of unconfined groundwater at which the pressure is equal to that of the atmosphere.
Wisconsinan (or Wisconsin):	the uppermost Pleistocene glacial stage and deposits thereof. The type area is Wisconsin and Illinois; also found elsewhere inc. Southern Ontario. Dates from about 85,000 to 7,000 years before present.

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